Early Norian Radiolaria from Cyprus

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ABSTRACT
Lower Norian limestones from the Mamonia Complex, southwestern Cyprus, are characterized by diverse radiolarian assemblages. New taxa are described: *Bulbocyrtium latum* n. sp., *Caphtorocyrtium tenerum* n. gen., n. sp., *Capnuchosphaera theloides minor* n. ssp., *Haeckelicyrtium* (?) *carterae* n. sp., *Kinyrosphaera trispinosa* n. gen., n. sp., *K. helicata* n. gen., n. sp., *Nabolella trispinosa* n. sp., *Whalenella robusta* n. sp., and *Xiphotheca* (?) *spinellifera* n. sp.

KEY WORDS
Radiolaria,
systematics,
Triassic,
Norian,
Cyprus.

RÉSUMÉ
Radiolaires du Norien inférieur de Chypre.
Des calcaires du Norien inférieur de la formation de Mamonia, sud-ouest de Chypre, sont caractérisés par divers assemblages de radiolaires. De nouveaux taxons sont décrits : *Bulbocyrtium latum* n. sp., *Caphtorocyrtium tenerum* n. gen., n. sp., *Capnuchosphaera theloides minor* n. ssp., *Haeckelicyrtium* (?) *carterae* n. sp., *Kinyrosphaera trispinosa* n. gen., n. sp., *K. helicata* n. gen., n. sp., *Nabolella trispinosa* n. sp., *Whalenella robusta* n. sp. et *Xiphotheca* (?) *spinellifera* n. sp.

MOTS CLÉS
Radiolaires,
systématique,
Trias,
Norien,
Chypre.

INTRODUCTION

The presence of Radiolaria in the Triassic sedimentary rocks of Cyprus was indicated by many previous investigators (Lapierre 1975; Robertson & Woodcock 1979; Swarbrick & Robertson 1980). Although these fossils are abundant and well preserved, there is no systematic study of them. Assemblages of the upper Norian were only illustrated before (Bragin & Krylov 1996). This work deals with the diverse lower Norian fauna, which includes many undescribed taxa.
Previous investigators described diverse Carnian and Norian radiolarian assemblages from Sicily, Greece and Turkey (De Wever *et al.* 1979), Austria (Kozur & Mostler 1972; 1979; 1981; Lahm 1984), Croatia (Halamić & Goričan 1995), Japan (Yao 1982; Yoshida 1986; Sugiyama 1997), western North America (Blome 1984; Yeh 1989), Philippines (Yeh 1990), eastern Russia (Bragin 1991). The Carnian to Norian stratigraphic interval was subdivided into radiolarian zones and subzones in the regions of Circum-Pacific belt (Yao 1982; Blome 1984; Bragin 1991; Sugiyama 1997). There are still no such subdivisions for the Mediterranean region and the stratigraphic ranges of numerous taxa remain uncertain. The description of well-dated and extremely diverse radiolarian assemblages from Cyprus will give supplementary data for further research in the Triassic biostratigraphy as well as in the taxonomy and evolution of the Triassic Radiolaria.

GEOLOGICAL SETTING

The Triassic of Cyprus was subdivided into two units: sedimentary and volcanogenous with sedimentary intercalations (Lapierre 1975). Swarbrick & Robertson (1980) defined two important parts of the Mamonia Allochthonous Complex-sedimentary Ayos Photios Group (Middle Triassic-Early Cretaceous) and volcanogenous Dhiarizos Group (Upper Triassic-Jurassic) (Fig. 1). Both these groups are incorporated into complicated allochthonous structures. The detached blocks of the Ayos Photios and Dhiarizos groups are common in the various melanges of the Mamonia Complex. The formations of the Mamonia Allochthonous Complex have wide distribution near Agia Varvara Village, southwestern Cyprus (Fig. 1). This area has an imbricated structure complicated by a system of sublatitudinal and NW-trending strike-slip faults. The lowermost structural unit is composed of the terrigenous melange with blocks derived both from the Troodos Complex and Mamonia Complex. They are overthrusted by series of allochthonous units that are represented by (Fig. 1):
1. Serpentinite melange with blocks of Troodos lavas;
2. Nappe composed of Agia Varvara metamorphics: amphibolites and quartz-mica shists;
3. Serpentinite melange with blocks derived both from the Mamonia Complex and Troodos Complex;
4. Nappe composed of Dhiarizos basic lavas with limestone intercalations (Upper Triassic to Lower Cretaceous).
5. Nappe of Ayos Photios sedimentary group represented by the Upper Triassic clastics (Bragin & Krylov 1996) and the Middle Jurassic to Cretaceous cherts, mudstones, calcarenites and sandstones.

The blocks of sedimentary rocks were studied in the field of terrigenous melange located at 34°45'N, 32°30'E. One of such blocks consists of white and pink platy micritic limestones with intercalations of grey and yellowish-pink cherts with observed thickness 14 m (Fig. 1). This limestone block is interpreted as a sedimentary lense derived from the Triassic part of Dhiarizos Group. This conclusion can be supported by the fact that these limestones did not contain clastic intercalations that are common for the carbonate sediments of the Ayos Photios Group (Swarbrick & Robertson 1980; Bragin & Krylov 1996).
Limestones and cherts contain abundant radiolarians replaced by calcite and recrystallized. Only one sample yielded radiolarians replaced by pyrite. The pyritized radiolarians exhibit well-preserved morphological features. The radiolarian assemblage is characterized by high taxonomic diversity. Radiolaria are represented by the following taxa: *Annulotriassocampe* sp. cf. *A. sulovensis*

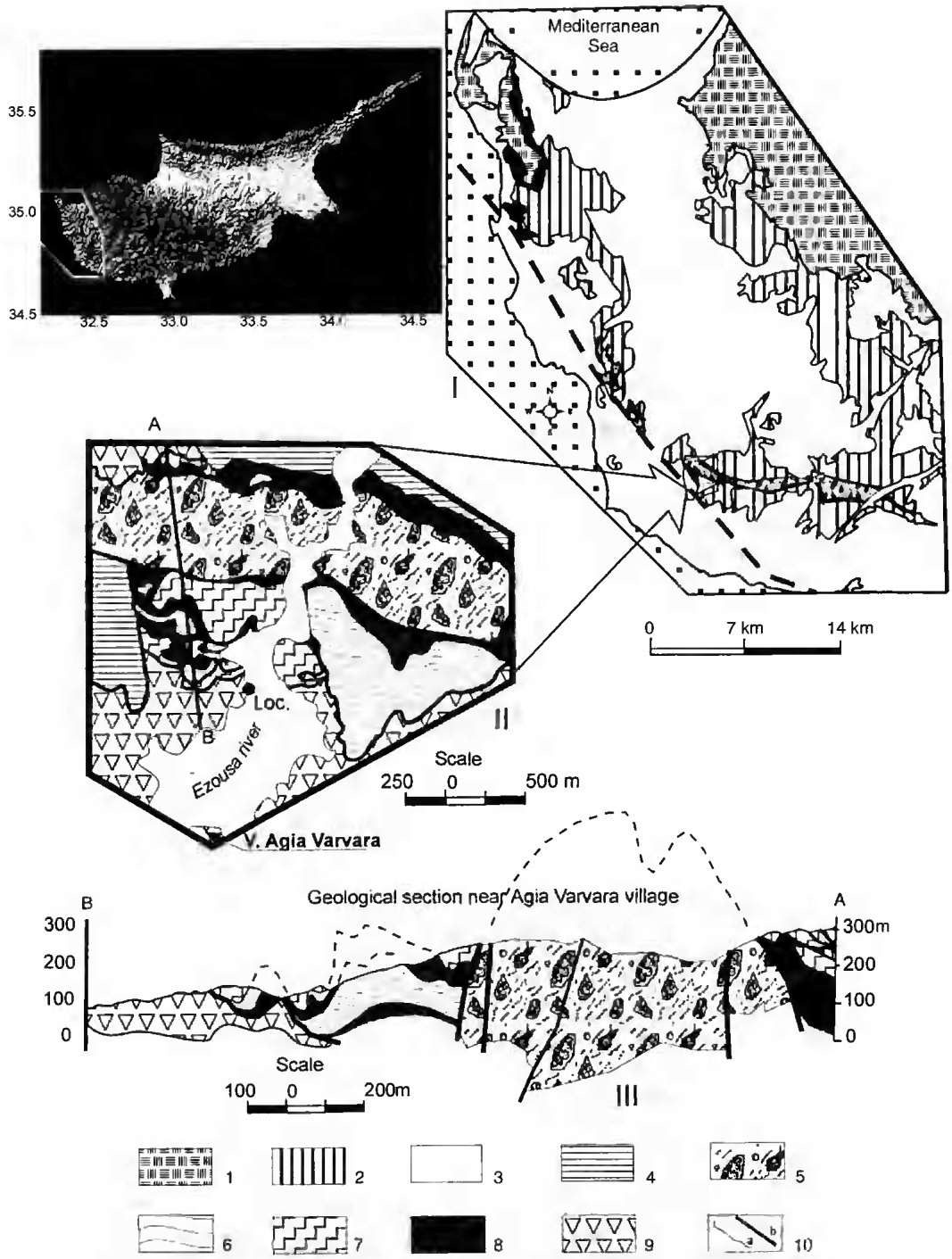

FIG. 1. — Geological position of the Upper Triassic radiolarian-bearing limestones in the southwestern Cyprus. **I**, map showing generalized geological position of the Mamonia Allochthonous Complex in the southwestern Cyprus; **II**, geological map of the Agia Varvara area (**Loc.**, position of studied limestone block); **III**, geological section A-B. Legend: **1**, Troodos Complex; **2**, Mamonia Allochthonous Complex; **3**, Cenozoic sediments; **4**, Ayos Photios Group (Upper Triassic-Cretaceous); **5**, serpentinite melange with Troodos blocks; **6**, Agia Varvara metamorphics; **7**, Dhiarizos Group (volcanics with limestone intercalations, Upper Triassic-Lower Cretaceous); **8**, serpentinite melange with Mamonia blocks; **9**, terrigenous melange; **10**, boundaries; **a**, stratigraphic; **b**, tectonic.

(Kozur & Mock, 1981), *Archaeocenosphaera* sp., *Bulbocyrtium latum* Bragin n. sp., *Caphtorocyrtium tenerum* Bragin n. gen., n. sp., *Capnodoce ruesti* Kozur & Mock, 1981, *Capnuchosphaera deweveri* Kozur & Mostler, 1979, *C.* sp. cf. *C. deweveri* Kozur & Mostler, 1979, *C. theloides minor* Bragin n. ssp., *C.* sp. cf. *C. theloides* De Wever, 1979, *C.* sp. aff. *C. carpathica* Kozur & Mock, 1981, Capnuchosphaeridae n. gen., sp. indet., *Carinabeliosoma carinata* (Kozur & Mostler, 1979), *Entactinosphaera* sp. aff. *E. simoni* Kozur & Mostler, 1979, *E.* (?) sp. 1, *E.* (?) sp. 2, *Ferresium* sp. aff. *F. conclusum* Carter, 1993, *Forenanellina* (?) sp., *Haeckelicyrtium carterae* Bragin n. sp., *Heliosoma* (?) *riedeli* Kozur & Mostler, 1981, *Heliosoma* (?) sp., *Icrioma tetrancistrum* De Wever, 1979, *I.* sp. aff. *I. tetrancistrum* De Wever, 1979, *Kahlerosphaera aspinosa* Kozur & Mock, 1981, *K. norica* Kozur & Mostler, 1979, *Karnospongella bispinosa* Kozur & Mostler, 1981, *Kinyrosphaera trispinosa* Bragin n. gen., n. sp., *K. helicata* Bragin n. gen., n. sp., *Kinyrosphaera* (?) sp., *Laxtorum* (?) sp., *Liassosaturnalis parvus* Kozur & Mostler, 1990, *Loffa* (?) sp., *Multimonilis pulcher* Yeh, 1989, *Nabolella trispinosa* Bragin n. sp., *Napora* (?) sp. 1, *N.* sp. 2, *Neopylentonema* sp. aff. *N. procera* Sugiyama, 1997, *Palaeosaturnalis triassicus* (Kozur & Mostler, 1972), *P. latiannulatus* Kozur & Mostler, 1983, *P. macki* Kozur & Mostler, 1983, *Paronaella norica* Kozur & Mock, 1981, *Paronaella* sp., *Pentactinocarpus* sp. aff. *P. tetracanthus* Dumitrica, 1978, *Pentactinocarpus* sp., *Praemesosaturnalis* sp. cf. *P. multidentatus* (Kozur & Mostler, 1972), *Pentaspongodiscus* sp. 1, *P.* sp. 2, *Poulpus piabyx* De Wever, 1979, *Pseudosaturniforma carnica* Kozur & Mostler, 1979, *Praenanina veghae* Kozur, 1994, *Praeorbiculiformella goestlingensis* Kozur & Mostler, 1978, *Pseudostylosphaera* (?) sp., *Sarla* (?) sp., *Sepsagon* sp., *Setbucapsa* sp., *Spongostylus carnicus* Kozur & Mostler, 1979, *S. tortilis* Kozur & Mostler, 1979, *Sulovella constricta* Kozur & Mock, 1981, *Syringocapsa batodes* De Wever, 1979, *Syringocapsa* sp., *Trialatus robustus* (Nakaseko & Nishimura, 1979), *Triassobipedis* (?) sp., Triassocampidae n. gen., sp. indet., *Triassocrucella triassica* (Kozur & Mostler, 1978), *Veghicyclia* sp. cf. *V. robusta* Kozur & Mostler, 1972, *Vinassaspongus transitus* Kozur & Mock, 1981, *Whalenella* sp. aff. *W. perfecta* (Blome, 1984), *W. robusta* Bragin n. sp., *Xiphotheca rugosa* Bragin, 1991, *X. longa* Kozur & Mock, 1981, *X.* (?) *spinellifera* Bragin n. sp., *Xiphotheca* sp., *Xiphotheca* (?) sp., *Zbamojdasphaera proceruspinosa* Lahm, 1984. All these radiolarians come from a single sample.

The early Norian age of this assemblage is confirmed by the presence of conodonts *Epigondolella spatulata* (Hayashi) and such radiolarian taxa as *Capnodoce ruesti*, *Sulovella constricta* and *Vinassaspongus transitus*. Radiolarian assemblage is typical for the *Capnodoce ruesti* zone (Kozur & Mostler 1994) with some exceptions. Some species were known only from Carnian or older deposits: *Karnospongella bispinosa*, *Praenanina veghae*, *Spongostylus carnicus*. The locality from Cyprus may represent a latest occurrence of these taxa.

SYSTEMATICS

Subclass RADIOLARIA Müller, 1858
Order POLYCYSTINA Ehrenberg, 1838
Suborder SPUMELLARIA Ehrenberg, 1875
Superfamily HEXASTYLACEA Haeckel, 1862
Family ENTACTINIIDAE Riedel, 1967a

Genus *Entactinosphaera* Foreman, 1963

TYPE SPECIES. — *Entactinosphaera esostrongyla* Foreman, 1963.

Entactinosphaera sp. aff. ***E. simoni***
Kozur & Mostler, 1979
(Fig. 3C)

aff. *Entactinosphaera ? simoni* Kozur & Mostler, 1979: 72, pl. 4, fig. 5; pl. 7, fig. 2; pl. 8, fig. 1. – Lahm 1984: 17, pl. 1, fig. 10.

OCCURRENCE. — Lower Norian of Cyprus.

DESCRIPTION

Small spherical shell with six symetrically arranged spines, four of them in the same plane. Spines long, robust, Y-shaped. Cortical shell one-

layered, with prominent pores in irregular hexagonal to pentagonal pore frames.

REMARKS
This form differs from *E. simoni* Kozur & Mostler by more spherical cortical shell with robust spines.

Entactinosphaera **(?)** sp. 1
(Figs 2H, 3F)

DESCRIPTION
Shell spherical with four three-bladed spines lying in one plane. Distal parts of spines sometimes display small sinistral torsion. Shell with subspherical pores that are variable in size and enclosed in rectangular pore frames with prominent nodes at vertices. Shell surface sometimes with small thin secondary spines.

REMARKS
Although the external morphology is well preserved, the inner structure is uncertain. These forms are assigned tentatively to genus *Entactinosphaera*.

Entactinosphaera **(?)** sp. 2
(Fig. 3A)

REMARKS
Uncomplete specimen with visible inner shell illustrated. Nevertheless, the internal spicule cannot be observed due to the preservation (replacement by pyrite).

Family SEPSAGONIDAE
Kozur & Mostler, 1981

Genus *Sepsagon*
Dumitrica, Kozur & Mostler, 1980

TYPE SPECIES. — *Triactoma longispinosum* Kozur & Mostler, 1979.

Sepsagon sp.
(Fig. 3E)

DESCRIPTION
Shell subspherical with rough nodose surface, with small pores in rectangular pore frames. Three main spines long, curved, with Y-shaped cross-section and moderately developed dextral torsion.

REMARKS
Only one specimen was observed.

Genus *Pseudostylosphaera*
Kozur & Mostler, 1981

TYPE SPECIES. — *Pseudostylosphaera gracilis* Kozur & Mock, 1981.

Pseudostylosphaera **(?)** sp.
(Fig. 7I)

REMARKS
This form is characterized by short thin apophyses at the median parts of the main spines. It did not represent a typical double layered shell of *Pseudostylosphaera* and may belong to another genus.

Family HEXAPYLOMELLIDAE
Kozur & Mostler, 1979

Genus *Praenanina* Kozur, 1994

TYPE SPECIES. — *Praenanina veghae* Kozur, 1994.

Praenanina veghae Kozur, 1994
(Fig. 2B, C, E)

Praenanina veghae Kozut, 1994 *in* Kozur & Mostler, 1994: 247, pl. 2A, fig. 2; pl. 4A, figs 1, 3.

OCCURRENCE. — Middle (?) to upper Carnian of Hungary, lower Norian of Cyprus.

Family PENTACTINOCARPIDAE
Dumitrica, 1978

Genus *Pentactinocarpus* Dumitrica, 1978

TYPE SPECIES. — *Pentactinocarpus fusiformis* Dumitrica, 1978.

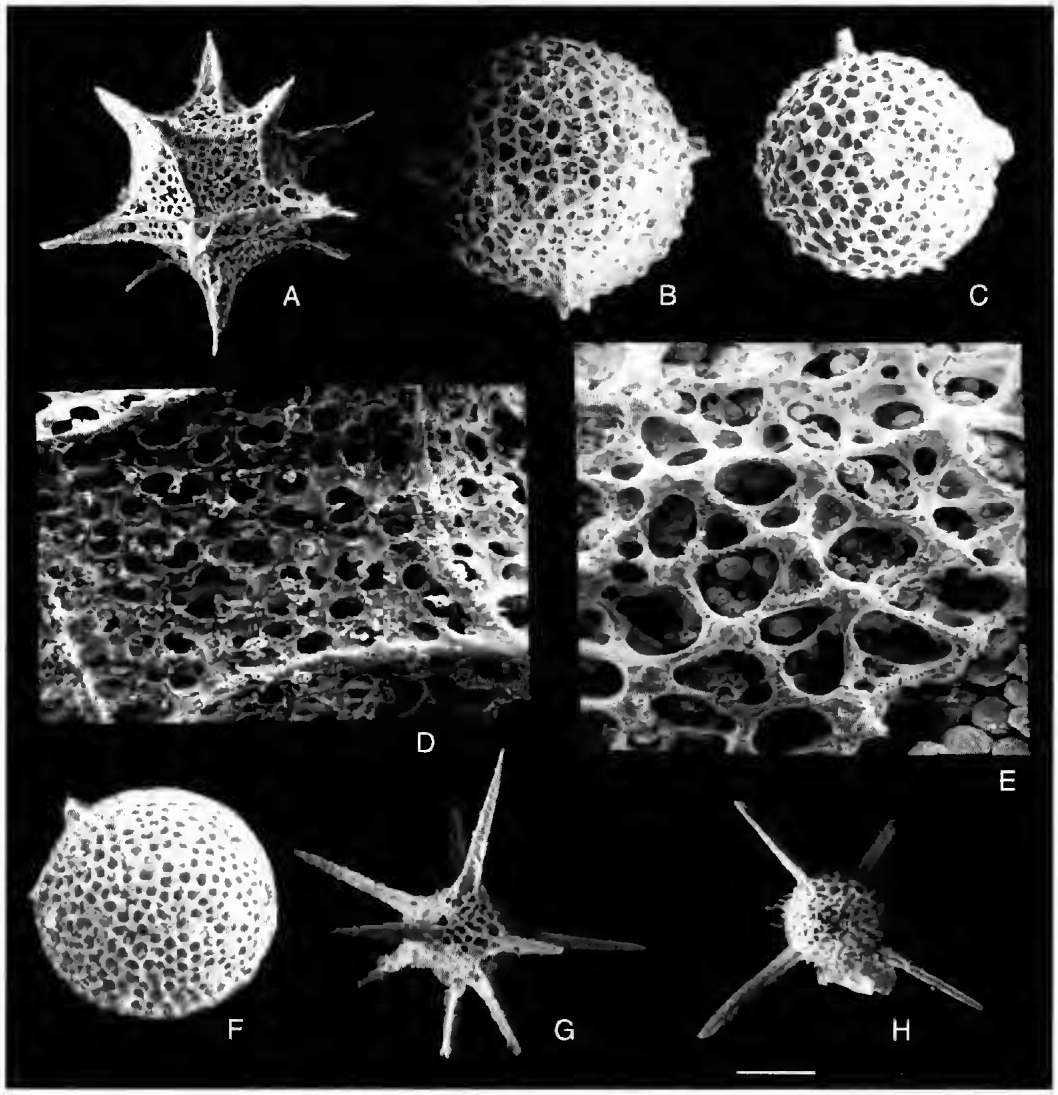

FIG. 2. — **A-D**, *Carinaheliosoma carinata* Kozur & Mostler; **D**, detail; **B**, **C**, **E**, *Praenanina veghae* Kozur; **E**, detail; **F**, *Archaeocenosphaera* sp.; **G**, *Heliosoma* (?) sp.; **H**, *Entactinosphaera* (?) sp. 1. Scale bar: A, B, C, F, 100 µm; D, E, 20 µm; G, H, 200 µm.

Pentactinocarpus sp.
aff. ***P. tetracanthus*** Dumitrica, 1978
(Fig. 7D)

REMARKS

This form differs from *Pentactinocarpus tetracanthus* (Dumitrica, 1978: 44, pl. 2, fig. 1) by larger and wider test. It differs from *P. sevaticus* (Kozur & Mostler, 1981: 21, pl. 52, fig. 3, pl. 53, figs 2, 5, pl. 55, fig. 1) by more delicate meshwork of cortical shell with smaller pores in hexagonal to pentagonal pore frames with small nodes at vertices. *P. magnus* (Kozur & Mostler, 1979: 55, pl. 10, fig. 1) has larger pores enclosed in the variable polygonal pore frames without nodes at vertices.

Pentactinocarpus sp.
(Fig. 7E)

REMARKS

This form possesses a delicate small test with

very thin and long apical, antapical and basal spines. The position of basal spines is similar to those of *Pentactinocarpus tetracanthus* Dumitrica but specimen from Cyprus differs by small size of test and by thin network-like meshwork of a cortical shell.

Superfamily ACTINOMMACEA Haeckel, 1862
Family XIPHOSTYLIDAE Haeckel, 1881

Genus *Archaeocenosphaera*
Pessagno & Yang, 1989

TYPE SPECIES. — *Archaeocenosphaera ruesti* Pessagno & Yang, 1989.

Archaeocenosphaera sp.
(Fig. 2F)

REMARKS
This form is similar to *Archaeocenosphaera* sp. aff. *A. laseekensis* Pessagno & Yang (Carter 1993: 67, pl. 1, figs 14, 19, 20). It differs by smaller test with pores that are more uniform in size.

Family ACTINOMMIDAE Haeckel, 1862

Genus *Carinaheliosoma*
Kozur & Mostler, 1981

TYPE SPECIES. — *Carinaheliosoma densiporata* Kozur & Mock, 1981.

Carinaheliosoma carinata
(Kozur & Mostler, 1979)
(Fig. 2A, D)

Heliosoma carinata Kozur & Mostler, 1979: 52, pl. 9, fig. 1-3.
Carinaheliosoma carinata (Kozur & Mostler, 1979) – Lahm 1984: 65, pl. 11, fig. 8.

OCCURRENCE. — Upper Triassic, Carnian to lower Norian of the European Tethys.

Genus *Heliosoma* Haeckel, 1882
emend. Kozur & Mostler, 1979

TYPE SPECIES. — *Heliosoma radians* Haeckel, 1887.

Heliosoma* (?) *riedeli
Kozur & Mostler, 1981
(Fig. 3B, D)

Heliosoma (?) *riedeli* Kozur & Mostler, 1981: 65, pl. 1, fig. 4. – Lahm 1984: 63, pl. 11, figs 2, 3.

OCCURRENCE. — Middle Triassic, Ladinian, Upper Triassic, Carnian (?) to lower Norian of the European Tethys.

***Heliosoma* (?) sp.**
(Fig. 2G)

DESCRIPTION
Small roughly subspherical to rectangular test with ten long thin three-bladed spines. Cortical shell with small roughly subcircular pores. Proximal parts of spines with deep grooves that become narrow at the middle parts and disappear at the distal parts.

REMARKS
This form differs from *Heliosoma* (?) *riedeli* Kozur & Mostler by small size of cortical shell and its roughly spherical to rectangular shape.

Genus *Kahlerosphaera*
Kozur & Mostler, 1979

TYPE SPECIES. — *Kahlerosphaera parvispinosa* Kozur & Mostler, 1979.

Kahlerosphaera aspinosa
Kozur & Mock, 1981
(Fig. 7A)

Kahlerosphaera ? aspinosa Kozur & Mock, 1981 *in* Kozur & Mostler, 1981: 36, pl. 47, fig. 3.

OCCURRENCE. — Upper Triassic, lower Norian of the European Tethys.

Kahlerosphaera norica
Kozur & Mock, 1979
(Fig. 6G, H)

Kahlerosphaera norica Kozur & Mock, 1981 *in* Kozur & Mostler, 1981: 36, pl. 15, fig. 4.

OCCURRENCE. — Upper Triassic, Carnian to lower Norian of the European Tethys.

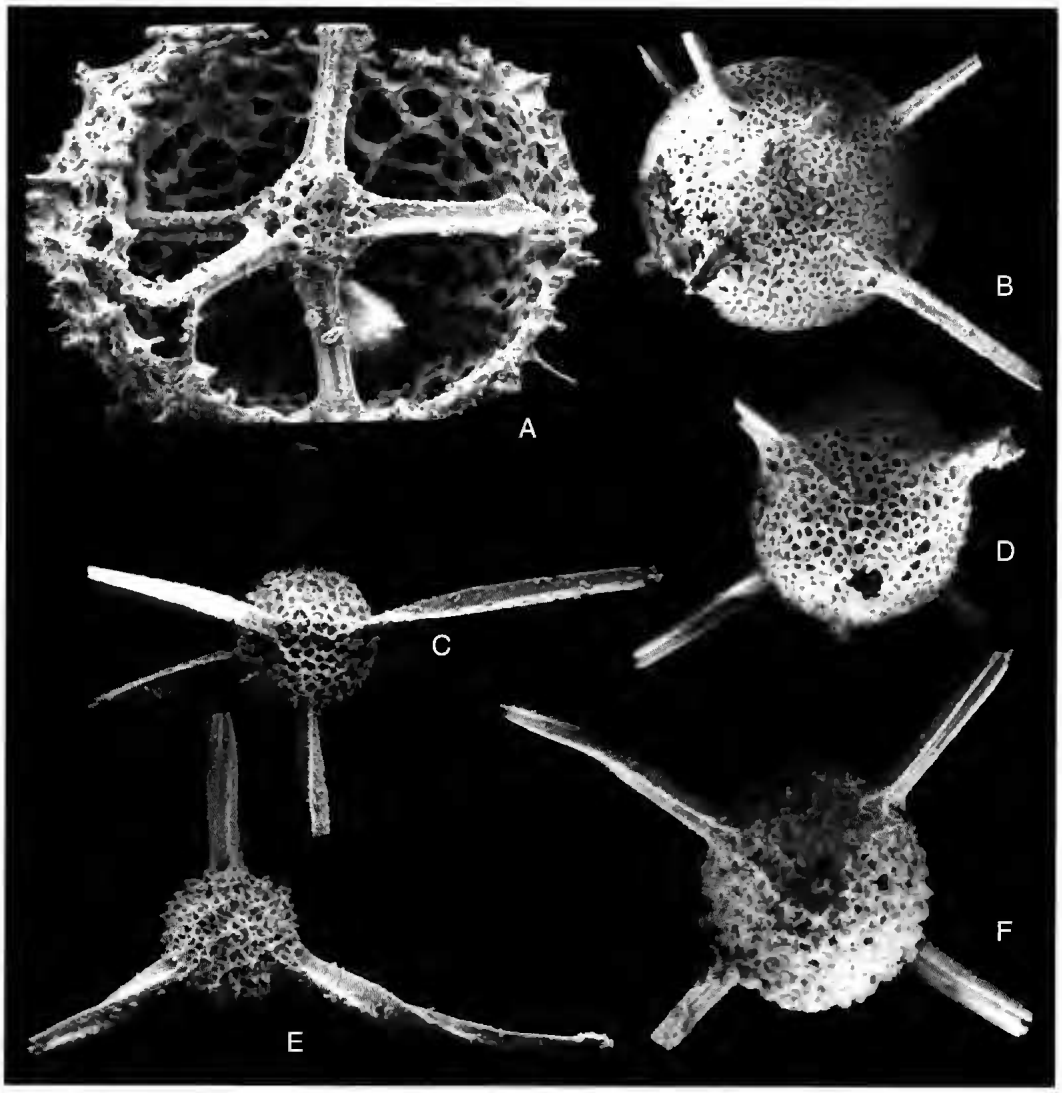

FIG. 3. — **A**, *Entactinosphaera* (?) sp. 1; **B**, **D**, *Heliosoma* (?) *riedeli* Kozur & Mostler; **C**, *Entactinosphaera* sp. aff. *E. simoni* Kozur & Mostler; **E**, *Sepsagon* sp.; **F**, *Entactinosphaera* (?) sp. 1. Scale bar: A, 50 µm; B-F, 100 µm.

Genus *Vinassaspongus* Kozur & Mostler, 1979

TYPE SPECIES. — *Vinassaspongus subsphaericus* Kozur & Mostler, 1979.

Vinassaspongus transitus Kozur & Mock, 1981 (Fig. 6D, F)

Vinassaspongus transitus Kozur & Mock, 1981 *in* Kozur & Mostler, 1981: 69, pl. 64, figs 1, 2.

OCCURRENCE. — Upper Triassic, lower Norian of the European Tethys.

Genus *Zhamojdasphaera* Kozur & Mostler, 1979

TYPE SPECIES. — *Zhamojdasphaera latispinosa* Kozur & Mostler, 1979.

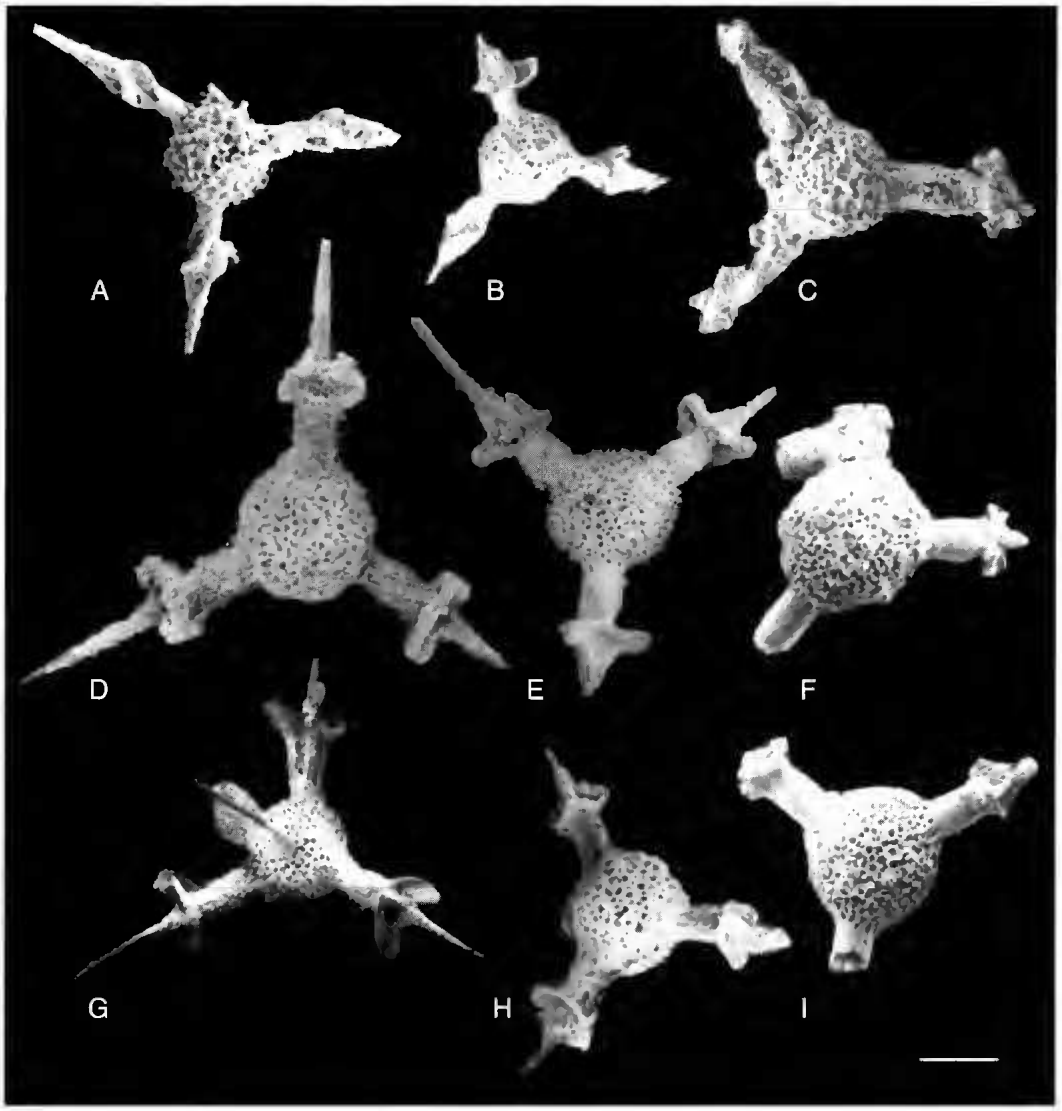

FIG. 4. — **A**, *Capnuchosphaera deweveri* Kozur & Mostler; **B**, *Capnuchosphaera* sp. cf. *C. deweveri* Kozur & Mostler; **C**, *Sarla* (?) sp.; **D**, **E**, *Capnuchosphaera theloides minor* Bragin n. ssp.; **E**, holotype; **F**, **H**, **I**, *Capnuchosphaera* sp. cf. *C. theloides* De Wever; **G**, *Capnuchosphaera* sp. aff. *C. carpathica* Kozur & Mock. Scale bar: A-C, F-I, 100 µm; D, E, 80 µm.

Zhamojdasphaera proceruspinosa
Lahm, 1984
(Fig. 8E)

Zhamojdasphaera proceruspinosa Lahm, 1984: 75, pl. 13, fig. 6.

OCCURRENCE. — Upper Triassic, Carnian-lower Norian of the Tethys.

Family CAPNUCHOSPHAERIDAE
De Wever, 1979
Genus *Capnuchosphaera* De Wever, 1979

TYPE SPECIES. — *Capnuchosphaera triassica* De Wever, 1979.

Capnuchosphaera deweveri
Kozur & Mostler, 1979
(Fig. 4A)

Capnuchosphaera triassica var. a De Wever, 1979: 84, pl. 4, figs 3-5.
Capnuchosphaera deweveri Kozur & Mostler,1979: 77, pl. 10, figs 2, 4-8; pl. 12, fig. 1. – De Wever 1982: 152, pl. 3, figs 10, 11; pl. 4, figs 1, 2. – Blome 1983: 16, pl. 1, figs 3, 8, 9, 16, 18; pl. 11, figs 1, 2, 16. – Lahm 1984: 81, pl. 14, fig. 7. – Yeh 1990: 8, pl. 2, fig. 5; pl. 10, fig. 8.

OCCURRENCE. — Upper Carnian to lower Norian of European Tethys and Pacific coastal areas.

Capnuchosphaera sp.
cf. ***C. deweveri*** Kozur & Mostler, 1979
(Fig. 4B)

aff. *Capnuchosphaera deweveri* Kozur & Mostler, 1979: 75, pl. 10, figs 4-7; pl. 12, fig. 1.

REMARKS
This form has shorter and thicker tumidaspinae than *C. deweveri* Kozur & Mostler. The new taxon cannot be described because of poor preservation.

Capnuchosphaera theloides minor
Bragin n. ssp.
(Fig. 4D, E)

Capnuchosphaera theloides var. a De Wever, 1979: p. 84, pl. 4, fig. 1. – Nakaseko & Nishimura 1979: p. 75, pl. 7, fig. 7. – De Wever 1982: 158, pl. 6, fig. 8.
Capnuchosphaera theloides – Yao 1982: pl. 1, fig. 23. – Yoshida 1986: pl. 12, fig. 4. – Bragin 1991a: p. 77, pl. 5, figs 14, 15.

HOLOTYPE. — Fig. 4E, GIN-4858-42. Cyprus, Agia Varvara Village, Mamonia Complex, Upper Triassic, lower Norian.

ETYMOLOGY. — Minor (Latin)-younger.

DIMENSIONS (based on five specimens). — Diameter of cortical shell 130-135 µm, total length of spines 220-260 µm, length of distal rod-like parts of spines 145-160 µm, maximal width of spines 80-90 µm.

OCCURRENCE. — Upper Triassic, upper Carnian to lower Norian of European Tethys, Japan and eastern Russia.

DESCRIPTION
Cortical shell spherical with three tumidaspinae situared in the same plane. Proximal parts of tumidaspinae smooth, moderately thick, central parts three-bladed, rerrahedrical, wirhout torsion, distal parts very long and thin withour clear differentiation from central parts. Cortical shell perforated by small circular pores in the irregular thorny pore frames.

REMARKS
These forms differ from *Capnuchosphaera theloides theloides* (De Wever, 1979: 83, pl. 3, figs 10-13) by rhe characrer of tumidaspinae with thinner proximal parts and longer distal parts that are nor well differenriared from rhe cenrral tetrahedrical parts.

Capnuchosphaera sp.
cf. ***C. theloides*** De Wever, 1979
(Fig. 4F, H, I)

cf. *Capnuchosphaera theloides* De Wever, 1979: 83, 84, pl. 3, figs 10-13; pl. 4, fig. 1.

REMARKS
This form has poorly preserved central and distal parts of tumidaspinae. Due to this preservation ir is difficult to give a precise determination.

Capnuchosphaera sp.
aff. ***C. carpathica*** Kozur & Mock, 1981
(Fig. 4G)

aff. *Capnuchosphaera carpathica* Kozur & Mock, 1981: 74, pl. 48, fig. 5.

OCCURRENCE. — Upper Triassic, lower Norian of Cyprus.

DESCRIPTION
Cortical shell subspherical with three tumidaspinae in the same plane and thin rod-like addirional spine perpendicular to the tumidaspinae. Tumidaspinae with moderately thick proximal parts, central parts subtetrahedrical, concave, without torsion, distal parts long and thin. Corrical shell with small subcircular pores in irregular pore frames.

REMARKS
This form differs from *C. carpathica* Kozur & Mock by more concave character of tumidaspinae and by the presence of additional spine.

Genus *Sarla* Pessagno, 1979

TYPE SPECIES. — *Sarla prietoensis* Pessagno, 1979.

***Sarla* (?) sp.**
(Fig. 4C)

DESCRIPTION
Cortical shell subspherical, slightly flattened to subdiscoidal, with three spines in the same plane. Spines three-bladed, without torsion, with slightly inflated middle parts. Distal parts of spines with tetragonal-like structures, poorly preserved. Pores of shell small, subcircular, enclosed in irregular pore frames.

REMARKS
Only one specimen was found. It is similar to *Eptingium* sp. A (De Wever 1982: 277, pl. 35, figs 3, 4; Grapes *et al.* 1990, fig. 9h) but possesses more inflated shell. Due to poor preservation, it is difficult to conclude that it is the same species as illustrated by De Wever. The generic assignment is under question. The terminations of spines resemble similar structures of *Kahlerosphaera*.

Genus *Sulovella* Kozur & Mock, 1981

TYPE SPECIES. — *Sulovella constricta* Kozur & Mock, 1981.

Sulovella constricta
Kozur & Mock, 1981
(Fig. 5A, B)

Sulovella constricta Kozur & Mock, 1981 *in* Kozur & Mostler, 1981: 77, pl. 64, fig. 2.
Capnuchosphaera cf. *constricta* – Halamič & Goričan 1995: pl. 2, fig. 11.
? *Capnuchosphaera crassa* Yeh, 1990: 8, pl. 1, figs 8, 11-13, 18, 19. – Halamič & Goričan 1995: pl. 2, fig. 12.

OCCURRENCE. — Upper Triassic, lower Norian of Carpathians, Croatia, Philippines (?) and Cyprus.

Genus *Icrioma* De Wever, 1979

TYPE SPECIES. — *Icrioma tetrancistrum* De Wever, 1979.

***Icrioma tetrancistrum* De Wever, 1979**
(Fig. 5G)

Icrioma tetrancistrum De Wever, 1979: 86, pl. 4, figs 13-15; 1982: 262, pl. 22, figs 1-6.

OCCURRENCE. — Upper Triassic, upper Carnian to lower Norian, European Tethys.

Icrioma* sp. aff. *I. tetrancistrum
De Wever, 1979
(Fig. 5I)

REMARKS
This form differs from *Icrioma tetrancistrum* De Wever by tetrahedrical rather then subspherical form of shell with arms less well differentiated from the central part of shell.

Genus *Kinyrosphaera* Bragin n. gen.

TYPE SPECIES. — *Kinyrosphaera trispinosa* n. sp.

SPECIES INCLUDED. — *Kinyrosphaera trispinosa* Bragin n. sp., *K. helicata* Bragin n. sp.

ETYMOLOGY. — Kinyras (Greek), legendary king of Cyprus, founder of pre-Greek Cypriot dynasty.

OCCURRENCE. — Upper Triassic, lower Norian of Cyprus.

DESCRIPTION
Capnuchosphaeridae with three spines partly covered by porous extensions of cortical shell. Cortical shell spherical or subspherical, with wall typical for the family. Central parts of spines with three large pores, distal parts thin, sometimes rod-like.

REMARKS
Kinyrosphaera Bragin n. gen. differs from *Icrioma* De Wever by presence of three spines, from *Capnuchosphaera* De Wever by porous extensions of cortical shell to the proximal parts of spines.

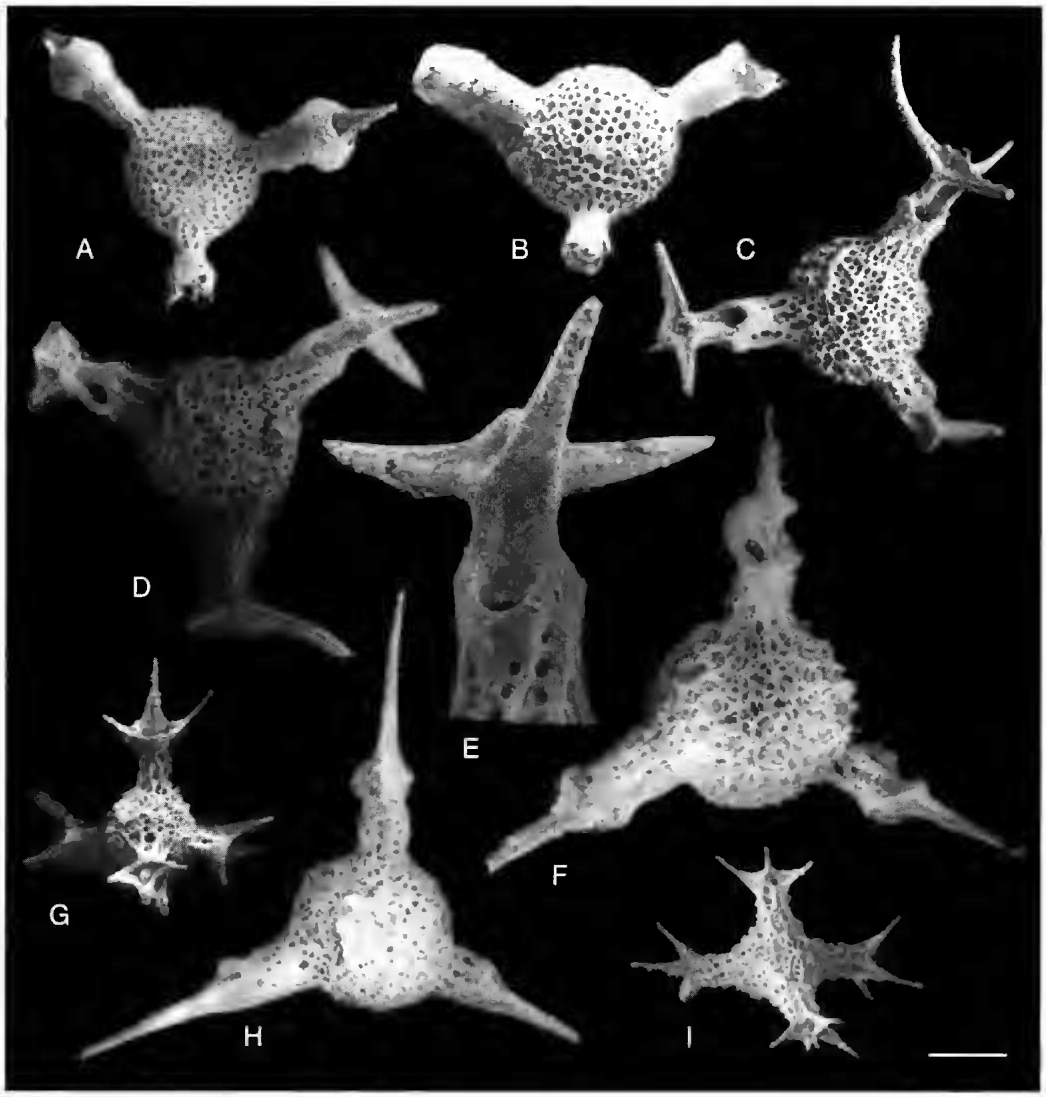

FIG. 5. — **A**, **B**, *Sulovella constricta* Kozur & Mock; **C-E**, *Kinyrosphaera trispinosa* Bragin n. gen., n. sp.; **C**, holotype; **D**, detail of spine; **F**, **H**, *Kinyrosphaera helicata* Bragin n. gen., n. sp.; **F**, holotype; **G**, *Icrioma tetrancistrum* De Wever; **I**, *Icrioma* sp. aff. *I. tetrancistrum* De Wever. Scale bar: A-C, G, I, 100 µm; D, F, H, 80 µm, E, 35 µm.

Kinyrosphaera trispinosa Bragin n. sp.
(Fig. 5C-E)

HOLOTYPE. — Fig. 5C, GIN-4858-49, Cyprus, Agia Varvara Village, Mamonia Complex, Upper Triassic, lower Norian.

ETYMOLOGY. — *Trispinosa* (Latin), with three spines.

OCCURRENCE. — Upper Triassic, lower Norian of Cyprus.

DIMENSIONS (based on eight specimens). — Diameter of cortical shell 155-180 µm, length of spines without terminal parts 140-155 µm.

DESCRIPTION

Cortical shell spherical with nodose surface, with small subcircular to subrectangular pores in weakly developed rectangular pore frames. Spines moderately long, lie in the same plane. Proximal parts of spines short, cylindrical, with small sub-

circular pores arranged in longitudinal rows sometimes displaying small dextral twisting. Central parts of spines Y-shaped in cross-section, with three large pores. Distal parts of spines are divided into three rod-like terminations slightly curved distally with small smooth node at their joints.

REMARKS
Kinyrosphaera trispinosa Bragin n. gen., n. sp. differs from *K. helicata* Bragin n. gen., n. sp. by non-twisted central parts of spines and by trifurcation of distal parts of spines.

Kinyrosphaera helicata Bragin n. sp.
(Figs 5F, H, 6A)

? *Capnuchosphaera* (?) sp. – Halamič & Goričan 1995: pl. 2, fig. 10.

HOLOTYPE. — Fig. 5F, GIN-4858-51, Cyprus, Agia Varvara Village, Mamonia Complex, Upper Triassic, lower Norian.

ETYMOLOGY. — Helix (Greek), spiral shell.

OCCURRENCE. — Upper Triassic, lower Norian of Cyprus, upper Carnian of Croatia.

DIMENSIONS. — Diameter of cortical shell 160-200 µm, total length of spines 220-270 µm, maximal width of spines 60-80 µm.

DESCRIPTION
Cortical shell spherical with nodose surface, with small subcircular to subrectangular pores in weakly developed rectangular pore frames. Spines long, lie in the same plane. Proximal parts of spines cylindrical, with small subcircular pores arranged in longitudinal rows and with longitudinal ridges between rows of pores. Central parts of spines strongly twisted sinistrally, Y-shaped in cross-section, with three large pores. Distal parts of spines long, thin, rod-like.

REMARKS
Kinyrosphaera helicata Bragin n. gen., n. sp. differs from *K. trispinosa* Bragin n. gen., n. sp. by the twisting of central parts of spines and by the long rod-like distal parts of spines.

Kinyrosphaera (?) sp.
(Fig. 6B)

REMARKS
This form has three porous extensions of the cortical shell at three main spines, but does not display typical Y-shaped in cross-section median parts of spines. Only one specimen was observed.

Capnuchosphaeridae gen. *et* sp. indet.
(Fig. 6E)

REMARKS
This form has four tetrahedrically arranged solid twisted spines. It differs from the representatives of genus *Sarla* Pessagno by the number of spines.

Family PANTANELLIIDAE Pessagno, 1977
Subfamily CAPNODOCINAE Pessagno, 1979

Genus *Capnodoce* De Wever, 1979

TYPE SPECIES. — *Capnodoce anapetes* De Wever, 1979.

Capnodoce ruesti Kozur & Mock, 1981
(Fig. 7B, C)

Capnodoce ruesti Kozur & Mock, 1981, *in* Kozur & Mostler, 1981: 74, fig. 65, fig. 2.

OCCURRENCE. — Upper Triassic, lower Norian of Carpathians and Cyprus.

Genus *Loffa* Pessagno, 1979

TYPE SPECIES. — *Loffa mulleri* Pessagno, 1979.

Loffa (?) sp.
(Fig. 6C)

DESCRIPTION
Shell subtetrahedrical, spongy, with four tubular spines (typical for Subfamily Capnodocinae). Spines tetrahedrically placed, smooth, each with three internal channels which end by three pores at terminations.

REMARKS
This form belongs to genus *Loffa* Pessagno due to the presence of four smooth tubular spines

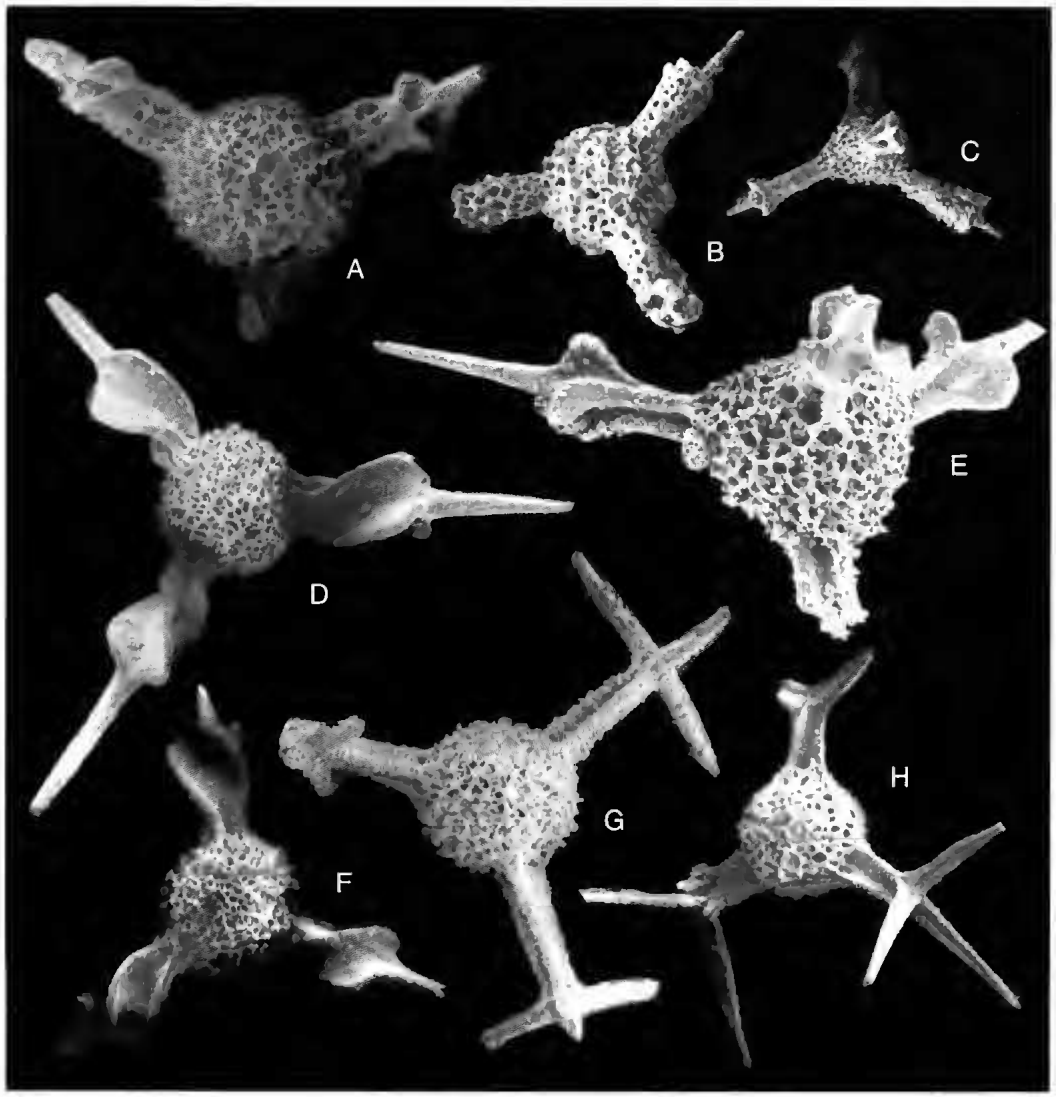

FIG. 6. — **A**, *Kinyrosphaera helicata* Bragin n. gen., n. sp.; **B**, *Kinyrosphaera* (?) sp.; **C**, *Loffa* (?) sp.; **D**, **F**, *Vinassaspongus transitus* Kozur & Mock; **E**, Capnuchosphaeridae gen. *et* sp. indet.; **G**, **H**, *Kahlerosphaera norica* Kozur & Mock. Scale bar: B, C, F, H, 100 µm; A, D, G, 80 µm, E, 50 µm.

without porous extensions of a cortical shell. It is characterized by irregularly spongy meshwork of shell and by thicker spines than other representatives of genus *Loffa*.

Superfamily SPONGODISCACEA Haeckel, 1862
Family SPONGURIDAE Haeckel, 1862

Genus *Spongostylus* Haeckel, 1882

TYPE SPECIES. — *Spongostylus hastatus* Haeckel, 1882.

Spongostylus carnicus
Kozur & Mostler, 1979
(Fig. 7F)

Spongostylus carnicus Kozur & Mostler, 1979: 58, pl. 9, figs 5, 6, 8, 9; 1981, pl. 38, fig. 3. – Lahm 1984: 69, pl. 12, fig. 4. – Carter *et al.* 1989: pl. 1, fig. 5. – Yeh 1989: 67, pl. 13, fig. 8. – Grapes *et al.* 1990: fig. 8O. – Halamič & Goričan 1995: pl. 2, figs 18, 19. – Knipper *et al.* 1997: pl. 2, fig. 1.

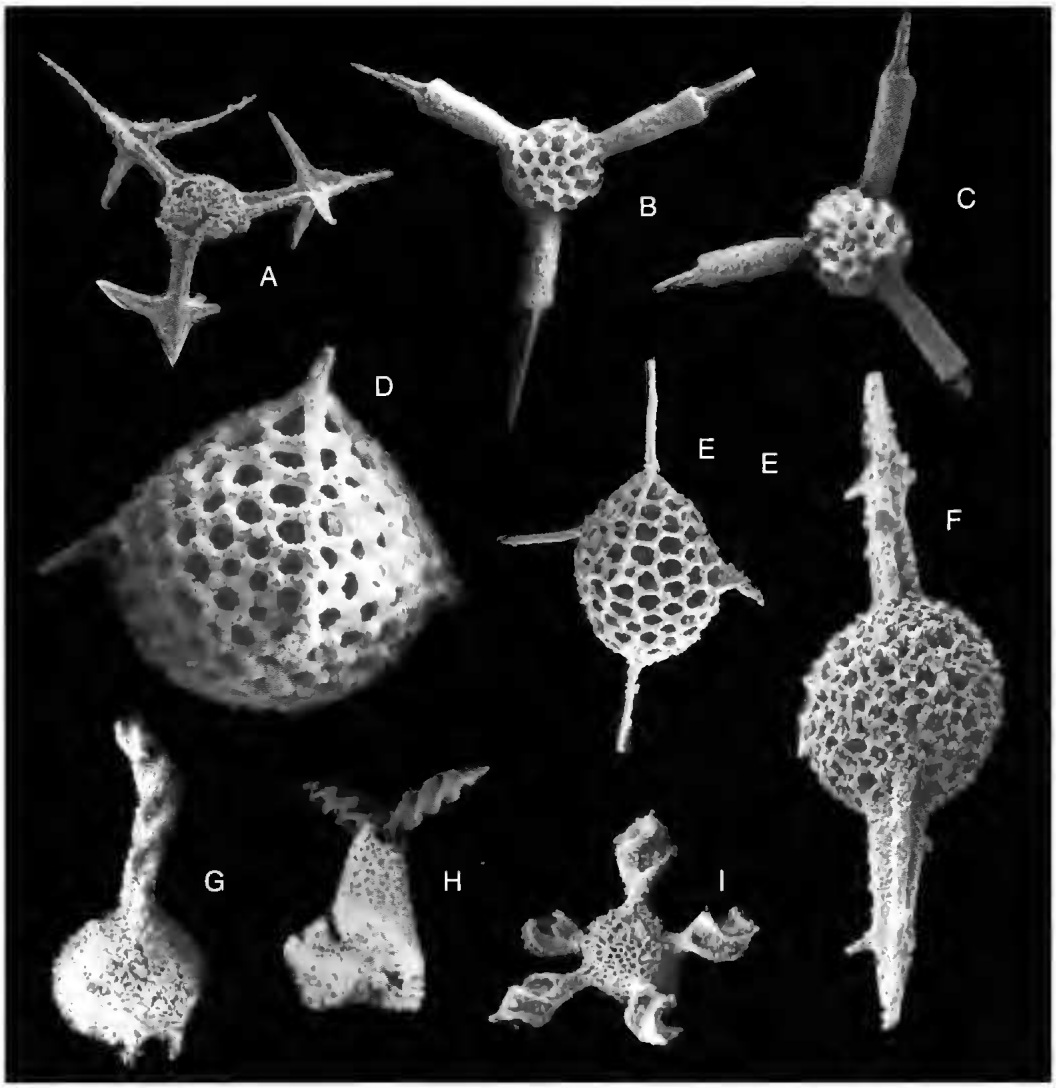

FIG. 7. — **A**, *Kahlerosphaera parvispinosa* Kozur & Mostler; **B**, **C**, *Capnodoce ruesti* Kozur & Mock; **D**, *Pentactinocarpus* sp. aff. *P. tetracanthus* Dumitrica; **E**, *Pentactinocarpus* sp.; **F**, *Spongostylus carnicus* Kozur & Mostler; **G**, *Karnospongella bispinosa* Kozur & Mostler; **H**, *Pentaspongodiscus* sp. 1; **I**, *Pseudostylosphaera* sp. Scale bar: A-C, E, G-I, 100 µm; D, F, 50 µm.

OCCURRENCE. — Upper Triassic, Carnian to lower Norian, worldwide in the low paleolatitudes.

Spongostylus tortilis
Kozur & Mostler, 1979
(Fig. 8A)

Spongostylus tortilis Kozur & Mostler, 1979: 58, pl. 4, fig. 2; pl. 11, fig. 6; pl. 18, fig. 2; 1981: pl. 40, fig. 2; pl. 56, fig. 3. – Lahm 1984: 68, pl. 12, fig. 3.

Spongostylus sp. – Knipper *et al.* 1997: pl. 1, figs 5, 6.

OCCURRENCE. — Upper Triassic, Carnian to lower Norian, worldwide in the low paleolatitudes.

Genus *Karnospongella*
Kozur & Mostler, 1981

TYPE SPECIES. — *Karnospongella bispinosa* Kozur & Mostler, 1981.

Karnospongella bispinosa
Kozur & Mostler, 1981
(Fig. 7G)

Spumellaria gen. *et* sp. indet. – Kozur & Mostler 1979: pl. 21, fig. 2.
Karnospongella bispinosa Kozur & Mostler, 1981: 42, pl. 50, figs 1, 2.
Gomberellus bispinosus (Kozur & Mostler) – Goričan et Bušer 1990: 146, pl. 1, fig. 10. – Halamič et Goričan 1995: pl. 1, fig. 6.
Karnospongella sp. B – Yeh 1989: pl. 14, fig. 16.
Bernoullius (?) *capricornus* – Bragin 1991b: 83, pl. 1, figs 1-5.

OCCURRENCE. — Middle to Upper Triassic, Ladinian to lower Norian, Tethys.

REMARKS
This finding represents the highest present-day known occurrence of *Karnospongella bispinosa* Kozur & Mostler.

Family FERRESIIDAE Carter, 1993

Genus *Ferresium* Blome, 1984

TYPE SPECIES. — *Ferresium laseekense* Blome, 1984.

Ferresium sp. aff. ***F. conclusum***
Carter, 1993
(Fig. 8B)

aff. *Ferresium conclusum* Carter, 1993: 68, pl. 9, figs 1-5.

REMARKS
This form differs from *F. conclusum* Carter by more strong torsion of main spines.

Family PATULIBRACCHIIDAE
Pessagno, 1971

Genus *Paronaella* Pessagno, 1971

TYPE SPECIES. — *Paronaella solanoensis* Pessagno, 1971a.

Paronaella norica Kozur & Mock, 1981
(Fig. 8G, H)

Paronaella norica Kozur & Mock, 1981 *in* Kozur & Mostler, 1981: 63, pl. 46, fig. 2.

OCCURRENCE. — Upper Triassic, Norian, worldwide in low paleolatitudes.

Paronaella sp.
(Fig 8I)

DESCRIPTION
Three-rayed spongy shell with short rays that have bulbous distal parts.

REMARKS
Due to poor preservation this form is difficult to compare with other representatives of genus *Paronaella*.

Genus *Triassocrucella* Kozur, 1984

TYPE SPECIES. — *Hagiastrum triassicum* Kozur & Mostler, 1978.

Triassocrucella triassica
(Kozur & Mostler, 1978)
(Fig. 8J)

Hagiastrum triassicum Kozur & Mostler, 1978: 144, pl. 1, fig. 4; pl. 2, fig. 11.
Crucella triassica (Kozur & Mostler) – Lahm 1984: 91, pl. 16, fig. 9.
Triassocrucella triassicum (Kozur & Mostler) – Kozur 1984: 33.

OCCURRENCE. — Upper Triassic, Carnian to Norian, European Tethys.

Superfamily PYLONIACEA Haeckel, 1881
Family ORBICULIFORMIDAE Pessagno, 1973

Genus *Praeorbiculiformella*
Kozur & Mostler, 1978

TYPE SPECIES. — *Praeorbiculiformella plana* Kozur & Mostler, 1978.

Praeorbiculiformella goestlingensis
Kozur & Mostler, 1978
(Fig. 8D)

Praeorbiculiformella goestlingensis Kozur & Mostler, 1978: 164, pl. 1, figs 10, 13; pl. 4, fig. 3. – Lahm 1984: 93, pl. 17, fig. 2.

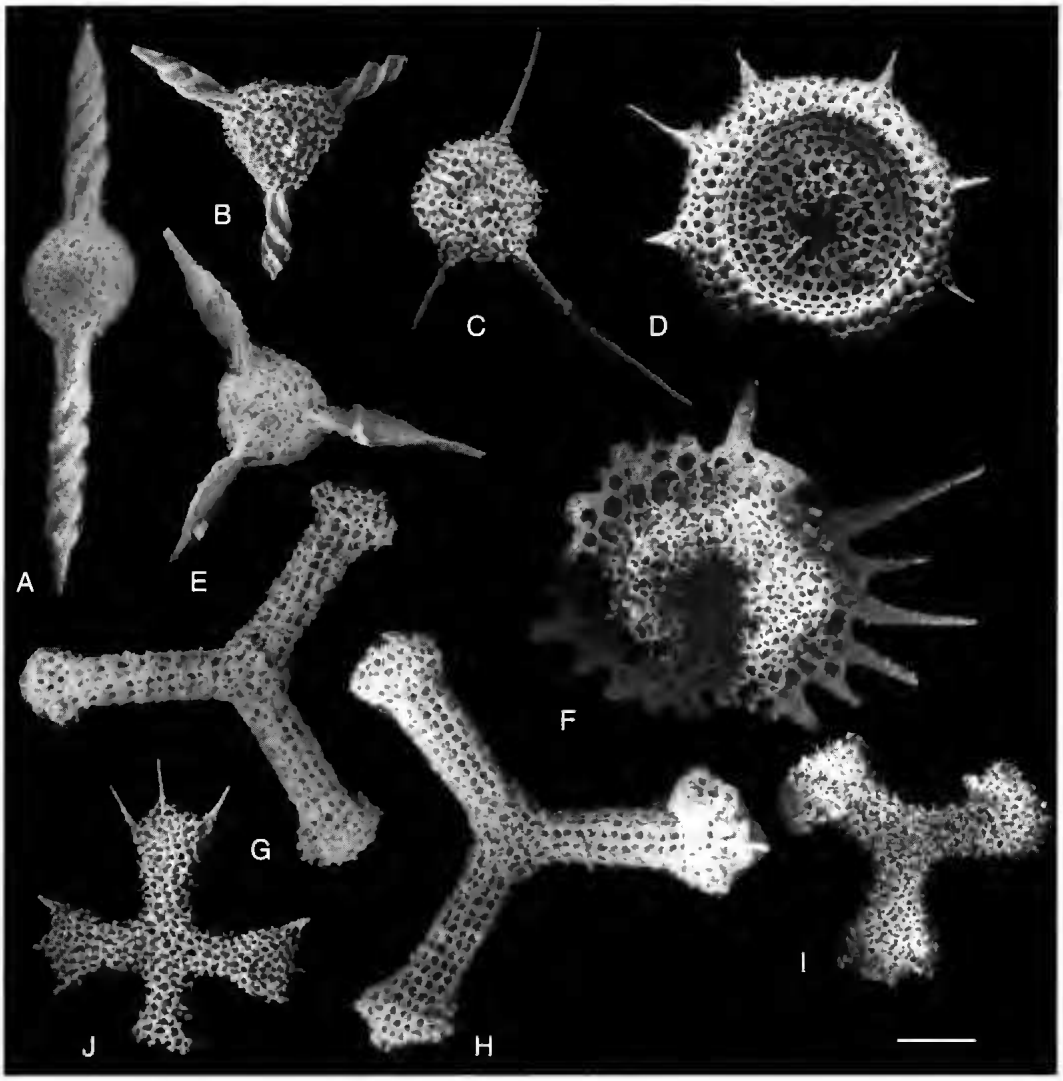

FIG. 8. — **A**, *Spongostylus tortilis* Kozur & Mostler; **B**, *Ferresium* sp. aff. *F. conclusum* Carter; **C**, *Pentaspongodiscus* sp. 2, **D**, *Praeorbiculiformella goestlingensis* Kozur & Mostler; **E**, *Zhamojdasphaera proceruspinosa* Lahn; **F**, *Veghicyclia* sp. cf. *V. robusta* Kozur & Mostler; **G**, **H**, *Paronaella norica* Kozur & Mock; **I**, *Paronaella* sp.; **J**, *Triassocrucella triassica* (Kozur & Mostler). Scale bar: A-H, J, 100 µm; I, 80 µm.

OCCURRENCE. — Upper Triassic, Carnian to lower Norian, European Tethys.

Superfamily SATURNALIACEA
Deflandre, 1953
Family SATURNALIDAE Deflandre, 1953
Subfamily PARASATURNALINAE
Kozur & Mostler, 1972

Genus *Palaeosaturnalis* Donofrio & Mostler, 1978

TYPE SPECIES. — *Spongosaturnalis triassicus* Kozur & Mostler, 1972.

Palaeosaturnalis triassicus
(Kozur & Mostler, 1972)
(Fig. 9A, B, E)

Spongosaturnalis triassicus Kozur & Mostler, 1972: 40, pl. 1, fig. 10; pl. 4, figs 1, 2. – De Wever *et al.* 1979: 81, pl. 2, fig. 2.

Acanthocircus triassicus (Kozur & Mostler) – De Wever 1982: 207, pl. 13, fig. 10.
Palaeosaturnalis triassicus (Kozur & Mostler) – Lahm 1984: 97, pl. 17, fig. 11.

OCCURRENCE. — Upper Triassic, Carnian to lower Norian, Tethys.

Palaeosaturnalis mocki
Kozur & Mostler, 1983
(Fig. 9G, H)

Palaeosaturnalis mocki Kozur & Mostler, 1983: 21, pl. 5, fig. 2.

OCCURRENCE. — Upper Triassic, lower Norian, Carpathians, Cyprus.

Palaeosaturnalis latiannulatus
Kozur & Mostler, 1983
(Fig. 9D)

Palaeosaturnalis latiannulatus Kozur & Mostler, 1983: 20, pl. 5, fig. 1.

OCCURRENCE. — Upper Triassic, lower Norian, Carpathians, Cyprus.

Genus *Liassosaturnalis*
Kozur & Mostler, 1990

TYPE SPECIES. — *Liassosaturnalis parvus* Kozur & Mostler, 1990.

Liassosaturnalis parvus
Kozur & Mostler, 1990
(Fig. 9C)

Liassosaturnalis parvus Kozur & Mostler, 1990: 203, pl. 4, figs 3, 7, 12, pl. 6, fig. 6.

OCCURRENCE. — Upper Triassic (Norian) to Lower Jurassic (Hettangian) of the European Tethys.

Genus *Praemesosaturnalis*
Kozur & Mostler, 1981

TYPE SPECIES. — *Spongosaturnalis bifidus* Kozur & Mostler, 1972.

***Praemesosaturnalis* sp.**
cf. *P. multidentatus*
(Kozur & Mostler, 1972)
(Fig. 9F)

cf. *Spongosaturnalis multidentatus* Kozur & Mostler, 1972: 38, pl. 1, fig. 20.

DESCRIPTION
Ring with two peripolar short main spines, with numerous very small auxiliary spines, and with eleven short outer rays. Main spines asymmetrically arranged.

REMARKS
This form differs from typical *P. multidentatus* (Kozur & Mostler) by the asymmetrical arrangement of main spines and by shorter outer rays.

Genus *Veghicyclia*
Kozur & Mostler, 1972

TYPE SPECIES. — *Veghicyclia pulchra* Kozur & Mostler, 1972.

Veghicyclia* sp. cf. *V. robusta
Kozur & Mostler, 1972
(Fig. 8F)

cf. *Veghicyclia robusta* Kozur & Mostler, 1972: 15, pl. 3, figs 1, 4, 7.

REMARKS
This form has poorly preserved central part. It possesses longer and thinner rays than typical *V. robusta*.

SPUMELLARIINA incertae familiae

Genus *Pentaspongodiscus*
Kozur & Mostler, 1979

TYPE SPECIES. — *Pentaspongodiscus tortilis* Kozur & Mostler, 1979.

***Pentaspongodiscus* sp. 1**
(Fig. 7H)

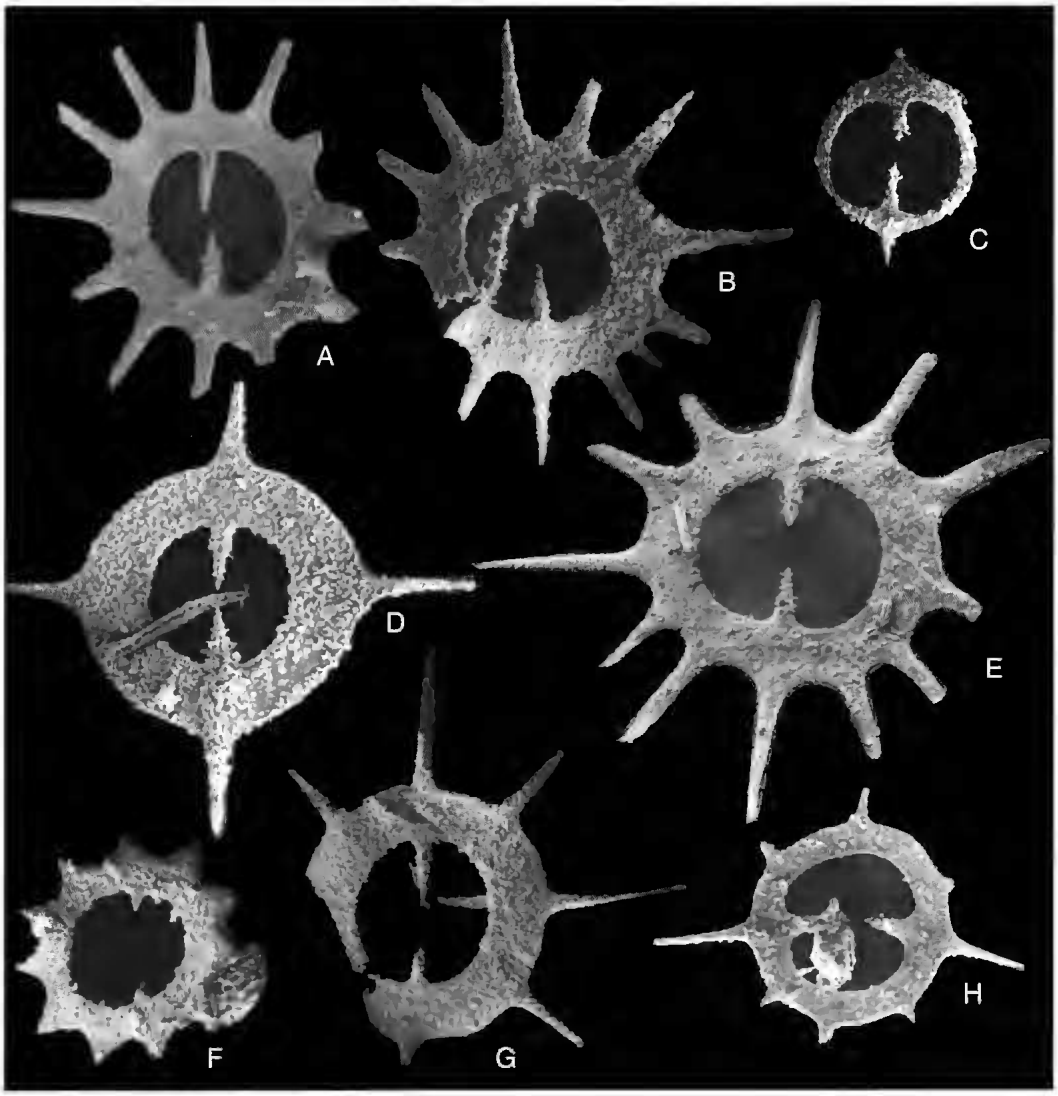

FIG. 9. — **A**, **B**, **E**, *Palaeosaturnalis triassicus* (Kozur & Mostler); **C**, *Liassosaturnalis parvus* Kozur & Mostler; **D**, *Palaeosaturnalis latiannulatus* Kozur & Mostler; **F**, *Praemesosaturnalis* sp. cf. *P. multidentatus* (Kozur & Mostler); **G**, **H**, *Palaeosaturnalis mocki* Kozur & Mostler. Scale bar: 100 µm.

DESCRIPTION

Shell small, flattened, discoidal, with five main spines. Spines short, thick, spindle-shaped, with Y-shaped cross-section and strong dextral torsion.

REMARKS

This form differs from other representatives of genus *Pentaspongodiscus* Kozur & Mostler by the spindle-shaped thick spines with strong torsion.

Pentaspongodiscus sp. 2
(Fig. 8C)

REMARKS

The illustrated specimen is uncomplete. It has probably six very thin spines.

Order NASSELLARIA Ehrenberg, 1875
Family POULPIDAE De Wever, 1981

Genus *Poulpus* De Wever, 1979

TYPE SPECIES. — *Poulpus piabyx* De Wever, 1979.

Poulpus piabyx De Wever, 1979
(Fig. 10A-C)

Poulpus piabyx De Wever, 1979: 98, pl. 7, figs 12, 13. – Kozur & Mostler 1979: 89, pl. 4, fig. 3. – De Wever 1982: 328, pl. 48, figs. 5, 6. – Yeh 1990: pl. 8, figs 3, 7, 9. – Sugiyama 1997: fig. 49 (15).

OCCURRENCE. — Upper Triassic, upper Carnian to lower Norian, worldwide in the low-paleolatitudes.

Genus *Neopylentonema* Kozur, 1984

TYPE SPECIES. — *Neopylentonema mesotriassica* Kozur, 1984.

Neopylentonema sp.
aff. ***N. procera*** Sugiyama, 1997
(Fig. 10E)

? *Poulpus* (?) sp. *C* – Yeh 1989: 74, pl. 6, figs 5, 10.
aff. *Neopylentonema procera* Sugiyama, 1997: 161, figs 46-3a, b.

REMARKS
This form has longer and thinner apical spine and three feet than typical *N. procera*. It is more similar to *Poulpus* sp. C (Yeh 1989). Only a few specimens were obtained, mostly poorly preserved.

Family FOREMANELLIDAE Dumitrica, 1982

Genus *Foremanellina* Dumitrica, 1982

TYPE SPECIES. — *Foremanellina helenae* Dumitrica, 1982.

Foremanellina (?) sp.
(Fig. 10J)

DESCRIPTION
Small form with three-bladed apical horn and three lateral horns, slightly inclined downwards.

REMARKS
This form has poor preservation and cannot be determined on the species level.

Family PSEUDOSATURNIFORMIDAE
Kozur & Mostler, 1979

Genus *Pseudosaturniforma*
Kozur & Mostler, 1979

TYPE SPECIES. — *Pseudosaturniforma latimarginata* Kozur & Mostler, 1979.

Pseudosaturniforma carnica
Kozur & Mostler, 1979
(Fig. 10I, K, L)

Pseudosaturniforma carnica Kozur & Mostler, 1979: 94, pl. 17, fig. 3; 1981: pl. 22, fig. 3.

OCCURRENCE. — Upper Triassic, Carnian to lower Norian of European Tethys.

Family ULTRANAPORIDAE Pessagno, 1977

Genus *Trialatus* Yeh, 1990

TYPE SPECIES. — *Trialatus megacornutus* Yeh, 1990.

Trialatus robustus
(Nakaseko & Nishimura, 1979)
(Fig. 11A, B)

Napora robusta Nakaseko & Nishimura, 1979: 78, pl. 8, figs 4-6. – Yoshida 1986: pl. 7, figs 1, 6, 8. – Bragin 1991a: 97, pl. 6, figs 2, 3.
Trialatus robustus (Nakaseko & Nishimura) – Sugiyama 1997: fig. 27 (16).

OCCURRENCE. — Upper Triassic, upper Carnian to lower Norian, Japan, eastern Russia and Cyprus.

REMARKS
Specimens obtained from Cyprus differ from typical by the presence of an additional postthoracic segment. This segment (abdomen?) has subtrapezoidal outline and very thin latticed wall. Common specimens from Japan and eastern Russia were obtained from cherts and did not represent this element, probably due to the preservation.

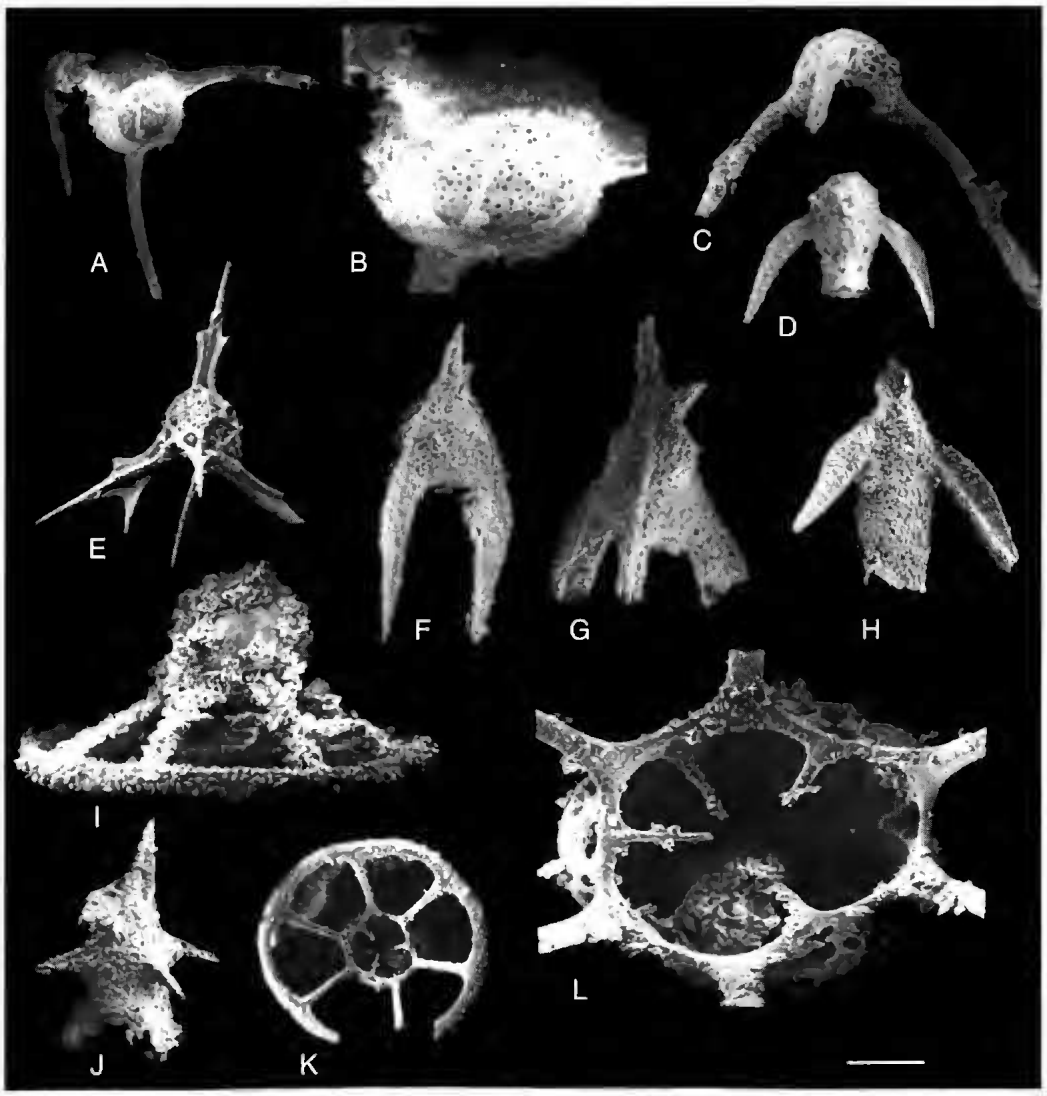

FIG. 10 — **A-C**, *Poulpus piabyx* De Wever; **D**, **H**, *Triassobipedis* (?) sp.; **E**, *Neopylentonema* sp. aff. *N. procera* Sugiyama; **F**, *Napora* (?) sp. 1; **G**, *Napora* (?) sp. 2; **I**, **K**, **L**, *Pseudosaturniforma carnica* Kozur & Mostler; **J**, *Foremanellina* (?) sp. Scale bar: A, D-H, J, K, 100 µm; B, 35 µm; C, 80 µm; I, 50 µm; L, 20 µm.

Genus *Napora* Pessagno, 1977

TYPE SPECIES. — *Napora bukryi* Pessagno, 1977.

***Napora* (?) sp. 1**
(Fig. 10F)

DESCRIPTION
Small subconical test with short thin three-bladed apical horn and three long, straight three-bladed feet. Very short and thin inclined vertical horn can be seen at apical part.

REMARKS
Only one specimen was obtained and illustrated.

***Napora* (?) sp. 2**
(Fig. 10G)

DESCRIPTION
Small test with apical horn and three feet.

Cephalis dome-shaped with moderately long slightly inclined apical horn and small inclined vertical horn. Thorax hemispherical, inflated, with numerous small pores. Feet moderately long, strongly flattened.

REMARKS
Only one specimen of imperfect preservation was found.

Family BULBOCYRTIDAE
Kozur & Mostler, 1981

Genus *Bulbocyrtium* Kozur & Mostler, 1981

TYPE SPECIES. — *Bulbocyrtium reticulatum* Kozur & Mostler, 1981.

Bulbocyrtium latum Bragin n. sp.
(Fig. 11I, J)

Bulbocyrtium aff. *reticulatum* Kozur & Mostler – Carter *et al.* 1989: pl. 1, fig. 1.

HOLOTYPE. — Fig. 11J, GIN-4858-23, Cyprus, Agia Varvara Village, Mamonia Complex, Upper Triassic, lower Norian.

ETYMOLOGY. — Latus (Latin), broad.

OCCURRENCE. — Upper Triassic, lower Norian, Cyprus.

DIMENSIONS (based on three specimens). — Length of test without apical horn 260-320 µm, width of cephalis 165-175 µm, maximal width of test 280-340 µm, length of apical horn 80 µm.

DESCRIPTION
Test with four chambers. Cephalis large, spherical with thin three-bladed apical horn. Cephalis surface with network-like system of small nodes connected by thin ridges that form polygonal framework. Pores of cephalis small, subcircular, irregularly arranged. Thorax subcylindrical, more than twice shorter than cephalis. Abdomen subcylindrical to subtrapezoidal. Postabdominal segment with expanded termination and wide open aperture. Height of all postcephalic segments less than of cephalis. Small strictures are developed between cephalis, thorax and abdomen. Pores of postcephalic segments small, subcircular, irregularly arranged.

REMARKS
Bulbocyrtium latum Bragin n. sp., differs from *B. reticulatum* (Kozur & Mostler 1981: 106, pl. 11, fig. 1) by larger cephalis with finer network-like surface and by wider last segment.

Family DEFLANDRECYRTIIDAE
Kozur & Mostler, 1979

Genus *Caphtorocyrtium* Bragin n. gen.

TYPE SPECIES. — *Caphtorocyrtium tenerum* n. sp.

SPECIES INCLUDED. — *Caphtorocyrtium tenerum* Bragin n. sp.

ETYMOLOGY. — Caphtorim-Biblic name; ancestor of Cypriots.

OCCURRENCE. — Upper Triassic, lower Norian, Cyprus.

DESCRIPTION
Dicyrtid (or tricyrtid) form with small cephalis, large, conical postcephalic part, with an apical horn and three lateral horns.

REMARKS
Caphtorocyrtium n. gen. differs from *Deflandrecyrtium* (Kozur & Mostler, 1979: 98) by the presence of lateral horns. Genus *Planispinocyrtis* (Kozur & Mostler, 1981: 111) has multicyrtoid test. It is very difficult to conclude how many segments this genus has (two or three). Due to replacement by pyrite, the inner structure of apical part cannot be observed. Nevertheless, conical distal part of test has open aperture and represents one segment (thorax or abdomen).

Caphtorocyrtium tenerum Bragin n. sp.
(Fig. 11C-H)

HOLOTYPE. — Fig. 11F, GIN-4858-71, Cyprus, Agia Varvara Village, Mamonia Complex, Upper Triassic, lower Norian.

ETYMOLOGY. — Tener (Latin), tender.

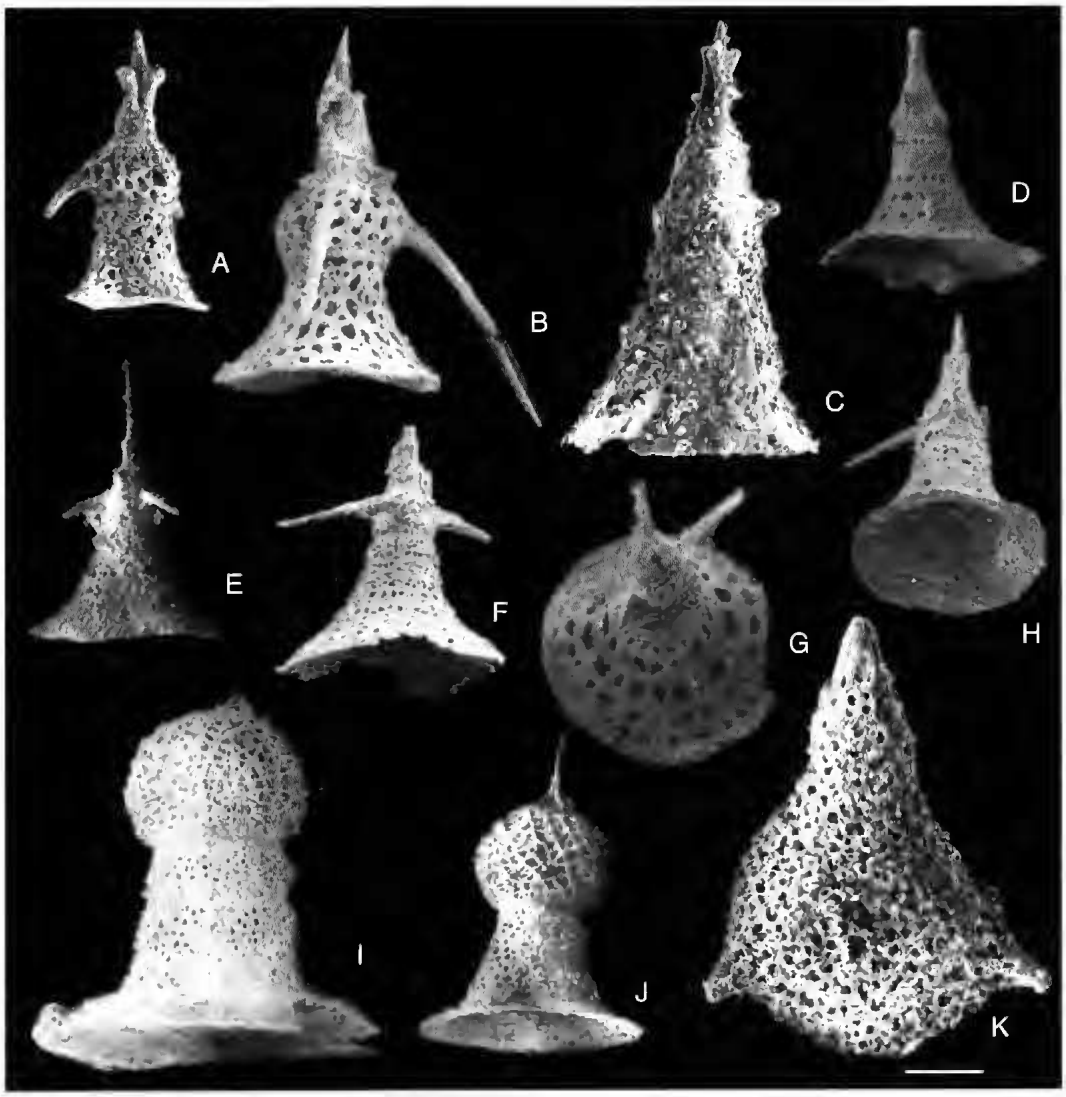

FIG. 11. — **A**, **B**, *Trialatus robustus* (Nakaseko & Nishimura); **C-H**, *Caphtorocyrtium tenerum* Bragin n. gen., n. sp.; **F**, holotype; **I**, **J**, *Bulbocyrtium latum* Bragin n. sp.; **J**, holotype; **K**, *Sethocapsa* (?) sp. Scale bar: A, D-H, J, 100 µm; B, I, 80 µm; C, K, 35 µm.

OCCURRENCE. — Upper Triassic, lower Norian, Cyprus.

DIMENSIONS (based on eleven specimens). — Length of test including apical horn 290-335 µm, maximal width of test 235-290 µm.

DESCRIPTION

Dicyrtid or tricyrtid form. Cephalis small, poreless, conical with long thin rod-like apical horn and three lateral horns as prolongations of D and L (?). Lateral horns thin, long, rod-like, slightly inclined distally. Postcephalic part large, conical to concave-conical with 5-6 transversal rows of subcircular to subrectangular pores, variable in size. Width of postcephalic part rapidly increasing distally, aperture wide, open.

Family NEOSCIADIOCAPSIDAE
Pessagno, 1969

Genus *Haeckelicyrtium*
Kozur & Mostler, 1979

TYPE SPECIES. — *Haeckelicyrtium austriacum* Kozur & Mostler, 1979.

REMARKS
Following Sugiyama (1997) the two-chambered hat-like Triassic nassellarians, which belong to neither *Deflandrecyrtium* Kozur & Mostler, 1979 nor *Dreyericyrtium* Kozur & Mostler, 1979 and have no basal feet, are assigned to genus *Haeckelicyrtium* Kozur & Mostler.

Haeckelicyrtium carterae Bragin n. sp.
(Fig. 12A-C, E, F)

HOLOTYPE. — Fig. 12A, GIN-4858-79, Cyprus, Agia Varvara Village, Mamonia Complex, Upper Triassic, lower Norian.

ETYMOLOGY. — New species is named after Dr. Elisabeth Carter in honour of her contributions to Mesozoic Radiolaria.

OCCURRENCE. — Upper Triassic, lower Norian, Cyprus.

DIMENSIONS (based on seven specimens). — Length of test without apical horn 190-235 µm, maximal length of apical horn 400 µm (Fig. 12E), maximal width of test 265-490 µm.

DESCRIPTION
Cephalis small subconical with long thin rod-like apical horn. Thorax large with hemispherical inflated proximal part and with strongly expanded distal part with a broad thoracic skirt. Cephalis and thorax single-layered with circular pores enlarging distally and arranged into hexagonal framework. Pores of thoracic skirt large, subspherical. Velum not developed, aperture large, open.

REMARKS
Haeckelicyrtium carterae Bragin n. sp. differs from *H. teren* Sugiyama, 1997 by inflated proximal part of thorax, well-developed stricture between thorax and thoracic skirt and by very long and thin apical horn.

Genus *Nabolella* Petrushevskaya, 1981

TYPE SPECIES. — *Squinabolella longispinosa* Kozur & Mostler, 1979.

REMARKS
According to the original definition (Petrushevskaya 1981: 76) only two-chambered hat-like forms with basal feet are assigned to this genus.

Nabolella trispinosa Bragin n. sp.
(Fig. 12D, G-I)

HOLOTYPE. — Fig. 12G, H, GIN-4858-82, Cyprus, Agia Varvara Village, Mamonia Complex, Upper Triassic, lower Norian.

ETYMOLOGY. — By the presence of three basal feet.

OCCURRENCE. — Upper Triassic, lower Norian, Cyprus.

DIMENSIONS (based on three specimens). — Length of test without apical horn and basal feet 180-200 µm, maximal width of test 290-300 µm, length of apical horn 100 µm.

DESCRIPTION
Cephalis dome-like with long thin rod-like slightly inclined apical horn and small indistinct pores. Distinctive stricture is developed between cephalis and thorax. Thorax hat-like with inflated proximal part and wide skirt-like distal part. Wall of thorax single, latticed with subcircular pores increasing distally. Median part of thorax with deep stricture. Three long rod-like spines begin from cephalis and are partly incorporated into thoracic wall. Their distal parts form three basal feet. Spines can be supposed as prolongations of D and L. Velum not developed.

REMARKS
This species differs from *Nabolella longispinosa* (Kozur & Mostler, 1979) having only three basal feet.

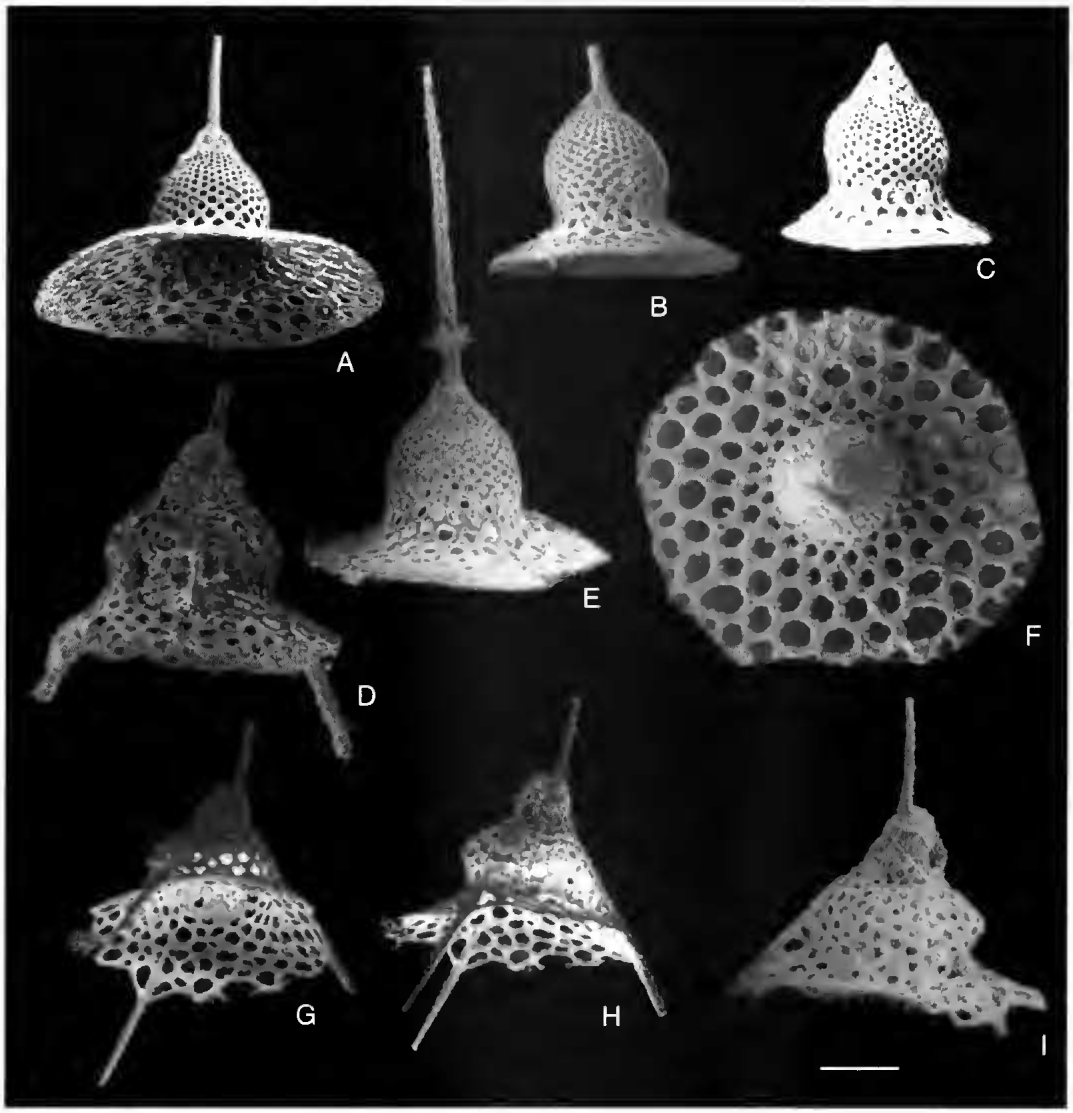

FIG. 12. — **A-C, E, F,** *Haeckelicyrtium carterae* Bragin n. sp., **A**, holotype; **D, G-I,** *Nabolella trispinosa* Bragin n. sp.; **G, H,** holotype. Scale bar: 100 µm.

Family SYRINGOCAPSIDAE Foreman, 1973

Genus *Syringocapsa* Neviani, 1900

TYPE SPECIES. — *Theosyringium robustum* Vinassa, 1901.

Syringocapsa batodes De Wever, 1979 (Fig. 13L, M)

Syringocapsa batodes De Wever, 1979: 91, pl. 6, figs 10, 12. – Nakaseko & Nishimura 1979: 81, pl. 8, figs 9, 10. – De Wever 1982: 292, pl. 41, figs 13, 14; pl.42, fig. 6.
Syringocapsa cf. *batodes* De Wever – Yoshida 1986: pl. 6, fig. 9, 10.
? unnamed *Podobursa*-like nassellarian – Pessagno *et al.* 1979: pl. 4, fig. 7.

OCCURRENCE. — Upper Triassic, upper Carnian to lower Norian, worldwide in the low-palaeolatitude regions.

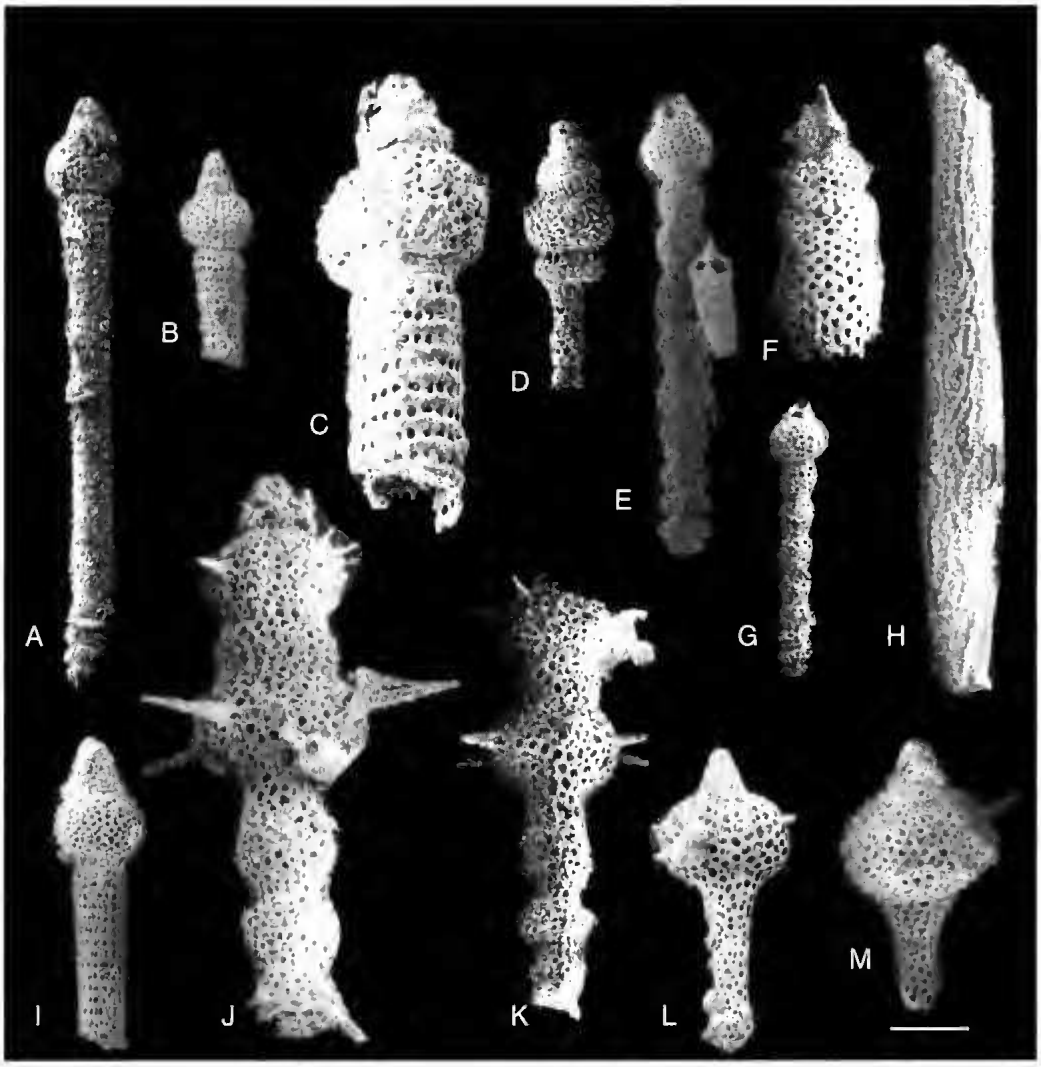

FIG. 13. — **A-C, I**, *Xiphotheca rugosa* Bragin; **D**, *Xiphotheca* sp.; **E, G**, *Xiphotheca longa* Kozur & Mock; **F**, Nassellaria gen. et sp. indet.; **H**, *Xiphotheca* (?) sp.; **J, K**, *Xiphotheca* (?) *spinellifera* Bragin n. sp.; **J**, holotype; **L, M**, *Syringocapsa batodes* De Wever. Scale bar: A, B, D-M, 100 µm; C, 35 µm.

Syringocapsa sp.
(Fig. 14I)

DESCRIPTION
Test small, with subconical apical part, subspherical, inflated middle part and distal part that tends to be tubular (incompletely preserved). Apical part poreless, with tiny, very short apical horn. Middle part with numerous circular pores in rectangular pore frames with sharp nodes at vertices, with occasional short spines.

REMARKS
This form cannot be compared or described as new taxon due to uncomplete preservation.

Family PSEUDODICTYOMITRIDAE
Pessagno, 1977b

Genus *Whalenella* Kozur, 1984

TYPE SPECIES. — *Dictyomitra arrecta* Hinde, 1908.

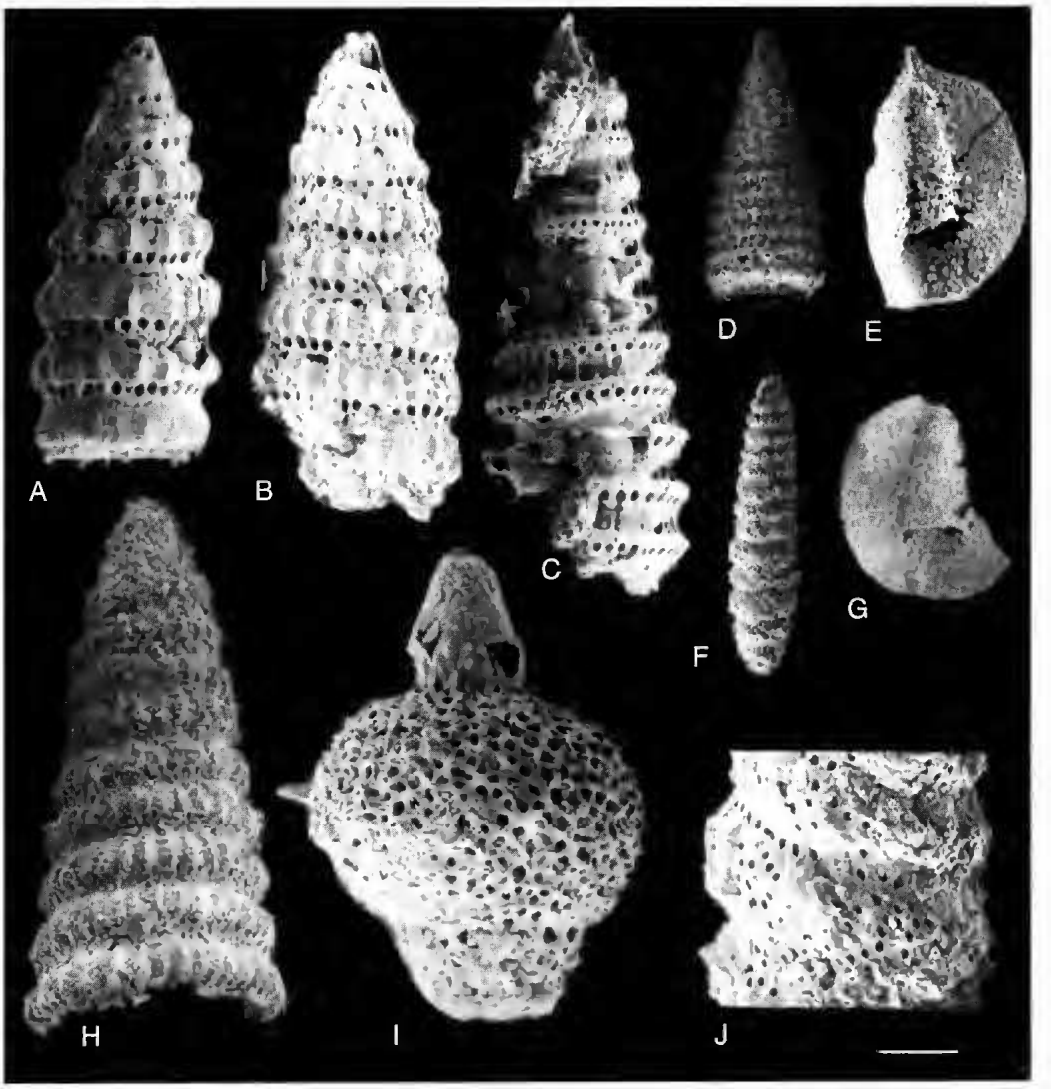

FIG. 14. — **A**, **B**, *Whalenella robusta* Bragin n. sp.; **A**, holotype; **C**, *Annulotriassocampe* sp. cf. *A. sulovensis* (Kozur & Mock); **D**, *Multimonilis pulcher* Yeh; **E**, **G**, Triassocampidae gen. et sp. indet.; **F**, **J**, *Laxtorum* (?) sp.; **H**, *Whalenella* sp. aff. *W. perfecta* Blome; **I**, *Syringocapsa* sp. Scale bar: A-C, H-J, 35 µm; D-G, 100 µm.

Whalenella sp.
aff. *W. perfecta* (Blome, 1984)
(Fig. 14H)

aff. *Corum perfectum* Blome, 1984: pl. 13, figs 2, 7, 16; pl. 17, fig. 11.

REMARKS

This form differs from *Whalenella perfecta* (Blome) by larger number of chambers (twelve *vs* seven). Other external morphological features are very similar. There are discontinuous costae and single row of small pores at each postabdominal chamber.

Whalenella robusta Bragin n. sp.
(Fig. 14A, B)

HOLOTYPE. — Fig. 14A, GIN-4858-12, Cyprus, Agia Varvara Village, Mamonia Complex, Upper Triassic, lower Norian.

ETYMOLOGY. — Robustus (Latin), strong, stout.

OCCURRENCE. — Upper Triassic, lower Norian, Cyprus.

DIMENSIONS (based on five specimens). — Length of test 180-205 µm, maximal width of test 85-90 µm.

DESCRIPTION
Test multicyrtoid with 8-9 chambers. Cephalis poreless, dome-shaped, without apical horn. Thorax subtrapezoidal, smooth. Abdomen and postabdominal chambers with well-developed smooth discontinuous costae. Chambers of the middle part of the test have 16-18 costae (8-9 visible). Each chamber has single row of large, deep, circular to slightly elliptical pores. Height of chambers increases very slowly. Width of chambers increases to the fourth postabdominal chamber, then becomes constant or slightly decreasing.

REMARKS
This species differs from *Whalenella speciosa* (Blome, 1984) by less inflated, smooth costae that did not merge at final chambers, and by larger pores.

Genus *Multimonilis* Yeh, 1989

TYPE SPECIES. — *Multimonilis pulcher* Yeh, 1989.

Multimonilis pulcher Yeh, 1989
(Fig. 14D)

Multimonilis pulcher Yeh, 1989: 72, pl. 9, figs 9, 19.

OCCURRENCE. — Upper Triassic, upper Carnian-lower to middle Norian of Oregon and Cyprus.

Family TRIASSOCAMPIDAE
Kozur & Mostler, 1981

Genus *Annulotriassocampe* Kozur, 1994

TYPE SPECIES. — *Annulotriassocampe baldii* Kozur, 1994.

Annulotriassocampe sp.
cf. ***A. sulovensis*** (Kozur & Mock, 1981)
(Fig. 14C)

cf. *Triassocampe sulovensis* Kozur & Mock, *in* Kozur & Mostler, 1981: 99, pl. 13, fig. 3. – Yeh 1989: 76, pl. 2, fig. 13.

REMARKS
Only a few poorly preserved specimens were found.

Triassocampidae gen. *et* sp. indet.
(Fig. 14E, G)

DESCRIPTION
Test multicyrtoid, small. Cephalis dome-shaped, with indistinct pores, with thin apical horn. Test has 5-6 segments, the last ones with transversal rows of small pores. A flat, leaf-like extension begins from the proximal part of the apical horn and surrounds test as wide ellipsoidal ring. Two sides of ring form an angle (120°).

REMARKS
Only a few imperfect specimens were found.

Family SETHOCAPSIDAE Haeckel, 1881

Genus *Sethocapsa* Haeckel, 1881

TYPE SPECIES. — *Sethocapsa cometa* (Pantanelli, 1885).

Sethocapsa (?) sp.
(Fig. 11K)

DESCRIPTION
Test small. Cephalis poreless, dome-shaped, thorax subtrapezoidal with few pores between several longitudinal smooth ridges. Postabdominal part of test inflated with spongy wall and five to six (?) short basal feet. Aperture indistinct, might be closed.

REMARKS
This species is very rare in studied material.

NASSELLARIA incertae familiae

Genus *Xiphotheca* De Wever, 1979

TYPE SPECIES. — *Xiphotheca karpenissionensis* De Wever, 1979.

Xiphotheca rugosa Bragin, 1991
(Fig. 13A-C, I)

Xiphotheca rugosa Bragin, 1991a: 107, pl. 5, fig. 11, 13.

OCCURRENCE. — Upper Triassic, upper Carnian to lower Norian of eastern Russia and Cyprus.

Xiphotheca longa Kozur & Mock, 1981
(Fig. 13E, G)

Xiphotheca longa Kozur & Mock, *in* Kozur & Mostler, 1981: 113, pl. 41, fig. 2.

OCCURRENCE. — Upper Triassic, lower Norian of European Tethys.

Xiphotheca* (?) *spinellifera
Bragin n. sp.
(Fig. 13J, K)

HOLOTYPE. — Fig. 13J, GIN-4858-3, Cyprus, Agia Varvara Village, Mamonia Complex, Upper Triassic, lower Norian.

ETYMOLOGY. — Spinellifera (Latin), wearing small spines.

OCCURRENCE. — Upper Triassic, lower Norian, Cyprus.

DIMENSIONS (based on three specimens). — Length of test 700 µm, maximal width of abdomen 150-180 µm, maximal width of the second postabdominal chamber without equatorial spines 165-225 µm.

DESCRIPTION
Test large, very long, multicyrtoid. Cephalis small, dome-like. Thorax small, hemispherical. Cephalis and thorax without distinct pores. Abdomen large, inflated, with equatorially arranged thin short spines. First postabdominal segment twice smaller than abdomen, without spines. Second postabdominal chamber larger than abdomen, inflated, with equatorially arranged spines that are longer and thicker than spines of abdomen. Three last postabdominal chambers smaller than abdomen, moderately inflated, without equatorial spines. Last segment with small spines around open, small, subcircular aperture. All postthoracic segments with small subcircular pores in polygonal irregular pore frames.

REMARKS
Xiphotheca (?) *spinellifera* Bragin n. sp. differs from other described species of *Xiphotheca* De Wever by the presence of equatorial spines and by strong inflation of the second postabdominal segment. This form differs from representatives of *Syringocapsa* Neviani by well-developed segmentation of postabdominal part. The taxonomic positions of *Xiphotheca* (?) *spinellifera* Bragin n. sp. is still unclear.

Xiphotheca sp.
(Fig. 13D)

REMARKS
This form has strongly inflated first postabdominal chamber. The tubular part of test begins from the third postabdominal chamber.

***Xiphotheca* (?)** sp.
(Fig. 13H)

REMARKS
Only long fragments of tube without apical part were found. Tube without segmentation, with very small pores and thin longitudinal curved and bifurcated ridges is very characteristic and unknown among other representatives of *Xiphotheca* De Wever.

Genus *Laxtorum* Blome, 1984

TYPE SPECIES. — *Laxtorum hindei* Blome, 1984.

***Laxtorum* (?)** sp.
(Fig. 14F, J)

DESCRIPTION
Test multicyrtoid, spindle-shaped. Cephalis small, dome-shaped, poreless, smooth. Thorax subtrapezoidal, poreless, smooth. Postthoracic segments short, inflated, divided each from other by well-developed deep and narrow strictures. Width of segments slowly increasing up to the tenth segment and become decreasing at the distal part of test. Each postthoracic segment has

numerous small circular pores. They form single transversal row at strictures between segments.

REMARKS
This form differs from other representatives of genus *Laxtorum* by absence of apical horn and weak development of pores.

Genus *Triassobipedis* Kozur, 1984

TYPE SPECIES. — *Triassobipedis balatonica* Kozur, 1984.

***Triassobipedis* (?) sp.**
(Fig. 10D, H)

REMARKS
These small forms have two basal feet like representatives of genera *Triassobipedis* Kozur and *Bipedis* De Wever. They have characteristic tubular distal part of test that is sometimes longer than basal feet. Both illustrated specimens have imperfect preservation. Character of cephalic structure and segmentation of test are unclear.

Nassellaria gen. *et* sp. indet.
(Fig. 13F)

DESCRIPTION
Test multicyrtoid. Cephalothorax subconical, smooth, without stricture between cephalis and thorax, with apical horn and three lateral horns. All horns short and smooth. Abdomen inflated, subspherical, divided from thorax by deep stricture. Postabdominal part subcylindrical. Abdomen and postabdominal part with numerous subcircular pores enclosed in hexagonal to pentagonal pore frames.

REMARKS
Only few specimens were found. They did not show affinity with any Triassic form described before.

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REFERENCES

Blome C. D. 1983. — Upper Triassic Capnuchosphaeridae and Capnodocinae (Radiolaria) from East-Central Oregon. *Micropaleontology* 29 (1): 11-49.
— 1984. — Upper Triassic Radiolaria and radiolarian zonation from Western North America. *Bulletins of American Paleontology* 85 (1): 1-88.
Bragin N. Yu. 1991a. — *Radiolaria and Lower Mesozoic units of the USSR east regions*. Nauka, Moscow, 125 p. [in Russian].
— 1991b. — Carnian radiolarian assemblage from volcanogenous-chert deposits of the Ekonai Terrane (Koryak Highland). *Izvestiya Akademii Nauk SSSR, seriya geologicheskaya* 6: 79-86 [in Russian].
Bragin N. Yu. & Krylov K. A. 1996. — Stratigraphy and lithology of the Upper Triassic deposits of southwestern Cyprus (Vlambouros Formation). *Stratigraphy and geological correlation* 4 (2): 28-37 [in Russian with English translation].
Carter E. S. 1993. — Biochronology and Paleontology of uppermost Triassic (Rhaetian) radiolarians, Queen Charlotte Islands, British Columbia, Canada. *Mémoires de Géologie*, Lausanne, 11, 175 p.
Carter E. S., Orchard M. J., Tozer E. T. 1989. — Integrated ammonoid-conodont-radiolarian biostratigraphy, Late Triassic Kunga Group, Queen Charlotte Islands, British Columbia. *Current Research*, Part H, Geological Survey of Canada, Paper 89-1H: 23-30.
De Wever P. 1982. — Radiolaires polycystines du Trias et du Lias de la Téthys. Paris. *Société Géologique du Nord, Publication*, 7, 303 p.
De Wever P., Sanfilippo A., Riedel W. R. & Gruber B. 1979. — Triassic Radiolaria from Greece, Sicily and Turkey. *Micropaleontology* 25 (1): 75-110.
Dumitrica P. 1978. — Triassic Palaeoscenidiidae and Entactiniidae from the Vicentian Alps (Italy) and eastern Carpathians (Romania). *Dari de Seama Sedintelor, Institutul de Geologie si Geofizica* 64: 39-54.
Goričan Š. & Buser Z. 1990. — Middle Triassic radiolarians from Slovenia (Yugoslavia). *Geologija*, Ljubljana 31-32: 133-197.
Grapes R. H., Lamb S. H., Campbell H. J., Sporli B. & Simes J. E. 1990. — Geology of the red rocks-turbidite association, Wellington peninsula, New Zealand. *New Zealand Journal of Geology and Geophysics* 33: 377-391.
Halamić J. & Goričan Š. 1995. — Triassic radiolarites from Mts Kalnik and Medvednica

(Northwestern Croatia). *Geologia Croatica* 48(2): 129-146.

Knipper A. L., Satian M. A. & Bragin N. Yu. 1997. — Upper Triassic-Lower Jurassic Volcanogenic and Sedimentary Deposits of the Old Zod Pass (Transcaucasia). *Stratigraphy and geological correlation* 5 (3): 257-264 [in Russian with English translation].

Kozur H. 1984. — New Radiolarian taxa from the Triassic and Jurassic. *Geologish Paläontologishe Mitteilungen Innsbruck* 13 (2): 49-88.

Kozur H. & Mostler H. 1972. — Beittäge zur Erforschung der Mesozoischen Radiolaria. T. 1. Revision der Oberfamilie Coccodiscacea Haeckel, 1862 emend. und Beschreibung ihrer triassischen Vertreter. *Geologish Paläontologishe Mitteilungen Innsbruck* 2: 1-60.

— 1978. — Beiträge zur Erforschung der Mesozoischen Radiolaria. T. 2: Oberfamilie Trematodiscacea Haeckel 1862 emend. und Beschreibung ihrer triassischen Vertreter. *Geologish Paläontologishe Mitteilungen Innsbruck* 8: 123-182.

— 1979. — Beiträge zur Erforschung der Mesozoichen Radiolaria. T. III. Die Oberfamilien Actinommacea Haeckel 1862 emend., Artiscacea Haeckel 1882, Multiarcusellacea nov. der Spumellaria und triassische Nassellaria. *Geologish Paläontologishe Mitteilungen Innsbruck* 9, 112: 1-132.

— 1981. — Beiträge zur Erforschung der mesozoichen Radiolarien. Teil IV. Thalassosphaeracea Haeckel, 1862, Hexastylacea Haeckel, 1882 emend. Petrushevskaya, 1979, Sponguracea Haeckel, 1862, emend. und weitere triassische Lithocycliacea, Trematodiscacea, Actinommacea und Nassellaria. *Geologish Paläontologishe Mitteilungen Innsbruck* Sonderbd. 1: 208.

— 1983. — The polyphyletic origin and the classification of the Mesozoic saturnalids (Radiolaria). *Geologisch Paläontologische Mitteilungen Innsbruck* 13: 1-47.

— 1990. — Saturnaliacea Deflandre and some other stratigraphically important Radiolaria from the Hettangian of Lenggries/Isar (Bavaria, Northern Calcareous Alps). *Geologish Paläontologishe Mitteilungen Innsbruck* 17: 179-248.

— 1994. — Anisian to middle Carnian radiolarian zonation and description of some stratigraphically important radiolarians. *Geologish Paläontologishe Mitteilungen Innsbruck* Sonderbd. 3: 39-255.

Lahm B. 1984. — Spumellarienfaunen (Radiolaria) aus dem mitteltriassischen Buchensteiner-Schichren von Recoaro (Norditalien) und den oberrriassischen Reiflingerkalken von Grossreifling (Österreich)-Systematik-Stratigraphie. *Münchner Geowissenschaftliche Abhandlungen*, Reihe A, Geologie und Paläontologie, 1, 161 p.

Lapierre H. 1975. — Les formations sédimentaires et éruptives des nappes de Mamonia et leurs relations avec le Massif du Troodos. *Mémoires de la Société Géologique de France*, Paris, 123 p.

Nakaseko K. & Nishimura A. 1979. — Upper Triassic Radiolaria from Southwest Japan. *Science Reports, College of General Education, Osaka University* 28 (2): 61-109.

Pessagno E. A., Finch W. & Abbott P. 1979. — Upper Triassic Radiolaria from the San Hipolito Formation, Baja California. *Micropaleontology* 25 (2): 160-197.

Petrushevskaya M. G. 1981. — *Radiolaria Nassellaria of the World Ocean*. Nauka, Leningrad, 406 p. [in Russian]

Robertson A. H. F. & Woodcock N. H. 1979. — Mamonia Complex, Southwest Cyprus: evolution and emplacement of a Mesozoic continental margin. *Geological Society of America, Bulletin* 91: 651-665.

Sugiyama K. 1997. — Triassic and Lower Jurassic radiolarian biostratigraphy in the siliceous claystone and bedded chert units of the southeastern Mino Terrane, Central Japan. *Bulletin of the Mizunami Fossil Museum* 24: 79-193.

Swarbrick R. E. & Robertson A. H. F. 1980. — Revised stratigraphy of the Mesozoic rocks of southern Cyprus. *Geological Magazine* 117(5): 547-563.

Yao A. 1982. — Middle Triassic to Early Jurassic radiolarians from the Inuyama Area, Central Japan. *Journal of Geosciences*, Osaka City University 25: 53-70.

Yeh K.-Y. 1989. — Studies of Radiolaria from Fields Creek Formation, east-central Oregon, USA. *Bulletin of National Museum of Natural Sciences* 1: 43-109.

— 1990. — Taxonomic studies of Radiolaria from Busuanga Island, Philippines. *Bulletin of National Museum of Natural Sciences* 2: 1-63.

Yoshida H. 1986. — Upper Triassic to Lower Jurassic radiolarian biostratigraphy in Kagamigahara City, Gifu Prefecture, Central Japan. *Journal of Earth Sciences*, Nagoya University 34: 1-22.

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